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ABSTRACT

This guide attempts to help teachers of American Indian children in grades 4-6 provide a culturally relevant education that takes place in the regular classroom, includes content related to Indian students' lives, makes students proud, expands to other experiences, and enhances learning. Creating sacred places means responding appropriately to students' academic, social, emotional, physical, and spiritual needs. Research has shown that to empower Indian students to learn, their school programs must incorporate their language and culture, involve parents and community as partners, provide appropriate instruction, and use appropriate testing methods. The approach presented here combines the teaching of various subject areas and reinforces classroom instruction with language and cultural activities by using American Indian literature as a basis for instruction. Materials and activities are aligned with challenging content standards. This guide outlines 24 thematic units, which include background information, relevant Indian literature, objectives, activities, and content standards. Eight science-based units cover Indian houses; sun, moon, and stars; Indian foods; cycle of life; caring for land and animals; Indian art; earth, air, water, and fire; and Indians' use of trees. Eight social studies and history-based units cover tribal histories, before 1492, 1492 and the 1500s, 1600s and 1700s, 1800-68, 1869-99, 1900-52, and 1953-2000. Eight language arts-based units cover Indian contributions to communication, Indian-developed forms of writing, Indian authors, student writing, oral tradition and oratory, Indian stories, Indian biographies, and contemporary Indian children. A final section lists additional resources and sources for books. (SV)

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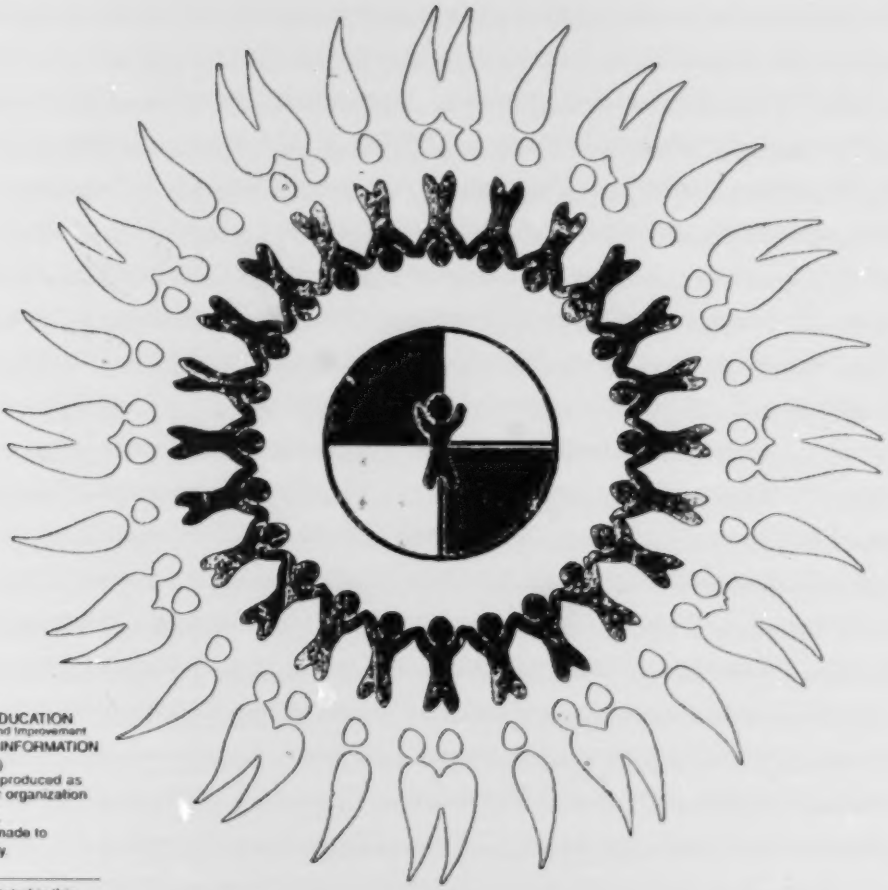

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by

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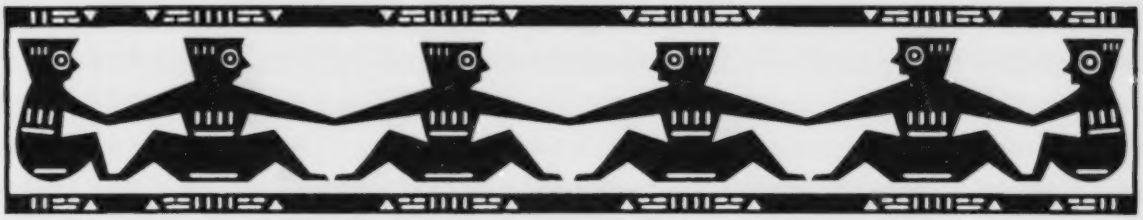

by

Sandra J. Fox D.Ed.

8 Science-Based Units
8 History/Social Studies-Based Units
8 Language Arts-Based Units

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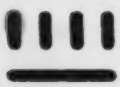

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INTRODUCTION

This book is an attempt to help teachers provide the culturally relevant curriculum that has long been the dream of Indian educators. The relevant curriculum that we have envisioned takes place in the regular classroom, includes content related to the lives of Indian children, makes them proud, expands to other experiences and enhances learning.

It used to be that there were some funds available to develop culturally relevant curricula, and some materials were developed. Few of those are still being used. There is a renewed interest in this dream, however, and Indian literature is a resource that can provide the basis for a more comprehensive culturally relevant curriculum. There are many more Indian authors writing books for children and more good Indian literature is being published.

This document provides teachers with background, materials (Indian literature), and activities for 24 units: eight are science-based thematic units, eight are social studies/history-based, and eight are language arts thematic units, all for students in grades 4-6. They are aligned with new, required science, social studies/history, language arts and mathematics content standards so that teachers are teaching what is expected of them and, at the same time, are making instruction more meaningful to the students. The units are to be integrated or multidisciplinary. The approach promotes the close coordination and cooperation of regular and cultural instruction teachers and their work. This is not a canned curriculum; it contains the ingredients necessary for a school to develop its own culturally-based curriculum for the intermediate grades.

This document also pays tribute to many: Indian and other authors who write books for and about Indians, Indian and other organizations that distribute books by and about Indians, Indian and other organizations that have made the improvement of teaching Indian children their aim, and teachers who have developed and implemented culturally-based curricula in their classrooms.

Some of the materials and activities included here have been taken from the work of others. For example, some of the teacher's background information included comes from math and science materials developed by ORBIS Associates of Washington, DC. The math and science activities included were developed by teachers of Indian children at summer workshops at Haskell Indian Nations University or at the University of Kansas MASTERS project - Math and Science Teachers for Reservation Schools, both taking place from 1992-1994. I have drawn on the work of educators such as Richard Nichols, Gwen Shunatona and Anne Litchfield of ORBIS Associates; Dan Wildcat, Lucretia Herrin, Dr. Michael Ward and Anita Chisholm who led the math and science workshops at Haskell; and Walter Smith of the MASTERS program at the University of Kansas.

I have not read every book listed in this document, and if I did, I would not be able to guarantee their being free of cultural bias or inaccuracies. I did utilize the publication *Through Indian Eyes: The Native Experience in Books for Children* by Beverly Slapin and Doris Seale to avoid books that may be offensive. I tried to promote books written by Indian authors. I recommend that books be reviewed by local Indian people to be sure. If it is found that a book is not acceptable to Indian people or to a tribe, especially, the book should definitely not be used. There is guidance for reviewing books and curriculum materials in *Through Indian Eyes* and in a document developed by the Indian Community School of Milwaukee listed in the last section of this book. I would like to know if there is a book that should definitely be eliminated from this document. If the use of the approach outlined in this document works, it should promote a resurgence of local storytelling and/or the writing of more children's books by Indian people.

The development of this document is part of an effort of the National Indian School Board Association to provide an Indian model of school reform that includes the Effective Schools framework with several enhancements: tribal values and organizational culture; wellness, healing and prevention strategies; leadership based on vision, wisdom and courage; the Learning Record performance-based assessment system; and the integration of Indian curriculum.

It is hoped that this document will be useful to parents, tutors, teachers, aides, administrators and school board members at schools where there are Indian students. I hope that Title IX and Johnson O'Malley programs can utilize it. I hope that parents who are homeschooling their children will find it helpful. I hope that teachers of nonIndian students will use it, especially for that week at Thanksgiving and, hopefully, beyond.

Most of all, I hope this document will help children somewhere. I greatly enjoyed developing it. I hope others will enjoy using it to create sacred places for children.

-SJF, Oglala Lakota, Albuquerque, NM

CREATING SACRED PLACES

Creating Sacred Places means responding appropriately to students' academic, social, emotional, physical and spiritual needs. This document addresses improving the teaching of Indian students and empowering them to learn by attending to these needs. The research is quite clear on the matter. If Indian students are to be empowered to learn, their school programs must include four characteristics (Cummins, The Empowerment of Indian Students):

1. **Language and culture must be incorporated into the school program.**

Considerable research suggests that for minority groups experiencing school failure, the extent to which students' language and culture are incorporated into the school program constitutes a significant predictor of academic success. Educators who see their role as encouraging their students to add a second language and culture to supplement rather than supplant their native language and culture are more likely to create conditions in which students can develop a sense of empowerment. Educators who see their role as getting their students to replace their home language and culture with English and white values in order to assimilate them into the dominant culture are more likely to create the conditions for student failure. Students who develop skills in two languages have been found to have learning advantages over students who have only one language.

2. **There must be an unbreakable bond between school and community**.

When educators involve parents as partners in their children's education, parents communicate to their children a positive attitude toward education that leads to improvement in the students' academic achievement. Teachers operate along a continuum from collaborative to exclusionary. Teachers with a collaborative orientation work closely with teachers or aides fluent in the student's first language and/or knowledgeable of the community in order to learn from them how to communicate effectively with parents. Teachers with an exclusionary orientation tend to regard teaching as their job and are likely to view collaboration with parents as either irrelevant or actually detrimental to children's progress. Students can become empowered only when education becomes a true community enterprise involving an equal partnership between educators at school and educators in the home, the children's families. In addition, the collective experience of the community must be used as the context for all learning in the school.

3. **Appropriate instruction must be provided.**

Research indicates that the learning difficulties of minority students are often caused by the way we teach them. These students frequently receive intensive instruction that confines them to a passive role and induces a form of "learned helplessness." This kind of instruction follows the transmission model in which it is the task of the teachers to impart knowledge or skills they possess to their students who do not yet have these skills. The teachers initiate and control the interaction, constantly orienting it toward the achievement of instructional objectives. In contrast, the experiential-interactive model of instruction focuses on giving students hands-on classroom experiences that provide students with a basis for understanding more abstract academic curricula. The interactive model also incorporates what we know about the relation between language and learning and promotes language-rich classrooms. The transmission model entails the suppression of students' experiences. The experiential-interactive model entails an additive orientation toward students' cultures and languages, an openness to collaborate with community resource persons, and active use of written and oral language skills. Learning styles of students must also be taken into account.

4. **Appropriate testing must be used.**

Classroom and psychological testing have disempowered and disabled minority students. Minority students are overrepresented in special education because of improper testing. To challenge the disabling of minority students, assessments must focus on the extent to which children's language and culture are incorporated within the school program, the extent to which educators collaborate with parents as partners in a shared enterprise, and the extent to which children are encouraged to use language (both tribal and English) actively within the classroom. In other words, the primary focus should be on remediating the educational interactions that Indian children experience. Further, it is being recognized that, while formal testing has a role to play, its impact is considerably greater when combined with classroom assessment. The longitudinal observation and monitoring of student progress throughout the school year by classroom teachers yields valuable data and is much more accurate and fair than formal testing, thus the present emphasis on performance-based assessment.

These four characteristics that address needs of Indian students must be considered carefully by every school seeking to educate Indian learners. Consider this quote from Ron Edmonds of the Effective Schools movement:

> We can, whenever and wherever we choose, successfully teach all children whose schooling is of interest to us. We already know more than we need to do that. Whether or not we do it must finally depend on how we feel about the fact that we haven't so far.

We are at a time when it is being demanded that schools produce higher achievement. Students must learn to read and write at higher levels, they must be able to solve more difficult math and science problems, they must be adequately prepared to meet the world and function successfully in the 21st Century. We must change the way we do things in order to produce these results. Schools have been failing students. Part of the problem is that we don't do what we know should be done, as Ron Edmonds states. We don't listen to what the research says.

Schools are involved in various school reform activities at this time. Teachers are being asked to do many things including:

align curriculum with the new content standards and new assessments,

do a better job of teaching reading and math,

utilize an integrated approach to teaching the various content areas,

teach for understanding and application and focus on depth,

teach disabled and gifted students in the regular classroom,

promote positive student behavior through a school-wide approach, and

provide meaningful parental involvement in the instructional process.

In addition, teachers of American Indian students are asked to:

incorporate American Indian content standards,

provide instruction for Indian children that is based upon research,

provide culturally relevant instruction within the regular classroom, and

promote the use of native languages to strengthen children's language ability.

This is only a partial list of the many things that teachers have to do. This document will provide assistance to teachers who really want to create sacred places for children and will help coordinate all that they have to do.

Essentially, the approach presented here combines the teaching of various subject areas and reinforces classroom instruction with language and cultural activities by utilizing American Indian literature as a basis for instruction. The materials and activities are aligned with the new, more challenging science, social studies/history, language arts and math content standards and American Indian content standards for each area.

To use the approach recommended by this book, teachers must –

1. Work closely with the cultural instructors at the school. The regular teacher and the cultural instructor should team teach these units. If not, the cultural instructor must provide input to the regular teacher to help integrate local culture into the regular classroom. A less effective approach would be that both the regular teacher and the cultural instructor teach the same topic, but separately. The science units provide good language immersion topics for teaching the native language while reinforcing classroom instruction. This would also be ideal.

2. Decide what units to teach and what order to teach them in. If all the teachers of the intermediate grades are using this book, they may want to determine which units each class will use. If you are the only teacher in the intermediate grades using this book, you may want to use all of the units or only some of them. They are organized in an order. For example, the science units start with Indian Houses in September; Sun, Moon and Stars in October; Food in November with Thanksgiving; Cycle of Life and Care of Land and Animals in the winter when most storytelling takes place – for example, coyote stories; Indian Art when the winter is getting long, basketball tournaments, etc.; Earth, Air, Water and Fire around Earth Day; and Indians' Use of Trees at maple sugaring time or around Arbor Day. You will want to align the units with what you are already teaching.

3. Decide what literature and activities to use. Of course, literature that deals with the local tribe(s) would be best. You will want a variety of literature to reach various students in your classroom. The example activities included can be adapted to your own tribe(s) and to the grade level you teach. Include your own ideas for additional materials and activities. Work closely with your librarian.

4. Align the McREL standards with your own content standards. The standards included were developed by the Mid-Continent Regional Educational Lab (McREL) and summarize the state standards. You will want to cross check them with the content standards your school has chosen to follow. Review the standards to give you ideas for further activities. The language arts and math standards cover all units in the book.

5. Plan a parental involvement strategy. Send home the background information for parents and teachers so the parents will know what students are studying. Be sure there are regular, meaningful parent involvement activities for the units.

6. Utilize good teaching strategies. Continue to utilize cooperative learning; have students read widely; use literature circles where various students are assigned to formulate questions for the reading; find interesting words; find interesting parts; etc. Many of the suggested activities are based on constructivism.

7. Utilize a form of performance-based assessment to track student progress.

• Background • Materials • Activities • Standards • for Science-Based Units

INDIAN HOUSES

Teacher's/Parent's Background Information -

Indian homes of the past ranged from the tepees of the Plains Indians to the chickees of the Seminoles. The Ojibwas had wigwams, the Iroquois had longhouses, the Pueblos had adobes, the Mandans had earth lodges and the Northwest Indians lived in plank houses. Indians lived in many different types of dwellings. Today, virtually all American Indians live in houses like those of other Americans; however, traditional Indian houses are still constructed and used sometimes for museums or special occasions, sometimes for dwellings as in the past.

Indian houses were usually warm in the winter and cool in the summer and they reflected the scientific and technological skills of their builders. Most houses were built to reflect the patterns of traditional beliefs that humans are an integral part of nature and should strive for harmony with it. The types of houses depended upon the weather and the resources available to build them. The Indians in different parts of the Americas mastered the technology for making concrete and the use of lime mortar, and they developed plaster and stucco. The early colonists borrowed Indian building techniques to build their first homes in America.

Other Indian houses include the Pawnee earth lodge, the crystal house of the California Chumash, the Navajo Hogan, the Kwakiutl painted house, the Bella Coola House of Myths, the Mohave Ramada, the Cherokee log houses, the Mesquaki wi-ki-ya-bis and many more. Then there were the apartment-like adobes of the southwest, the Pueblo of Acoma built high upon a mesa and the pyramids of Mexico, South America and of the Mississippi. These Indian pyramids have withstood earthquakes. American Indians were true architects. Architects, Buckminster Fuller – at the 1967 World's Fair- and Frank Lloyd Wright, utilized Indian principles of architecture.

The newcomers to this country built their towns and cities on spots that had been Indian settlements usually along rivers, the coast or other trade routes. The city of Washington was built on top of Naconchtanke, the main trading town of the Conoy Indians. Although the cities of the new Americans were built on top of Indian settlements, they did not, however, usually follow the building patterns and layouts of the Indian communities before them.

- *Indian Givers: How the Indians of the Americas Transformed the World* by Jack Weatherford, Fawcett Columbine, 1988.

LITERATURE FOR INDIAN HOUSES UNIT –

Where Indians Live by Naxhone.

First Houses: Native American Homes and Sacred Structures by Jean Guard Monroe and Ray A. Williamson.

The Wigwam and the Longhouse by Charlotte and David Yue.

The **Pueblo** by Charlotte and David Yue, Houghton Mifflin, 1986.

The Tipi, A Center of Native American Life by Charlotte and David Yue, Knopf, 1984.

The Igloo by Charlotte and David Yue, Houghton Mifflin, 1988.

The Houses The Indians Built by Sigmund A. Lavine, Dodd, 1975.

Houses of Hide and Earth, Houses of Wood, Houses of Snow, Houses of Adobe, Houses of Bark, Mounds of Earth and Shell by Bonnie Shemie, Tundra Books, Native Dwellings Series.

Mound Builders and Cliff Dwellers by Dale M. Brown, 1993.

The Ancient Cliff Dwellers of Mesa Verde by Caroline Arnold, Houghton Mifflin, 2000

American Indian Science, A New Look At Old Cultures by Fern Brown, Twenty First Century Books, 1997.

Indians at Home by Robert Hofsinde, Morrow, 1964.

The Indian Tipi, Its Construction and Uses by Reginald and Gladys Laubin.

The Hidatsa Earthlodge, Reprints in Anthropology, Volume 11 by Gilbert L. Wilson, American Museum of Natural History, 1934.

Native American Architecture by Peter Nabokov and Robert Easton.

Contemporary American Indian Architecture by C. H. Krinsky.

The Old Hogan by Margaret Garaway.

Building an Igloo by Ulli Steltzer, Douglas & McIntyre, 1981.

CHECK YOUR LIBRARY AND BOOKSTORES FOR OTHER BOOKS ON THE TOPIC.

ACTIVITIES FOR INDIAN HOUSES UNIT –

1. Provide introductory information on Indian houses from the teacher's background information.

2. Give the students guide questions and have them read about various kinds of Indian houses, summarize their findings and report them.

3. Have students learn what kinds of houses were used by Indians of their local area.

4. Have students do formal reports on the kinds of houses used by Indians of their local area.

5. Have the students determine what science was used in the construction of the Indian houses of the local area.

6. Have the students construct models of the Indian houses of the local area. Stress careful measurement and the importance of geometry that had to be used.

7. Have the students learn what kinds of things were inside the Indian houses of the local area.

8. Have the students visit traditional Indian houses if available.

9. Have Indian students compare and contrast Indian houses of the past and the houses they live in now.

10. Have the students determine if aspects of traditional home construction have been used in their houses today, for example adobe.

11. Have the students learn about the pyramids of Mexico and South America and compare them with the pyramids of Egypt.

12. Have an elder visit the classroom to discuss traditional house construction with the students.

13. Have the students give presentations on Indian houses to other students and to their parents.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University or through the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Review the science standards for this unit. They will suggest further math and science activities. Also utilize the activities in the *Keepers* books.

MATH --

"NATIVE ARCHITECTURE"

CULTURAL OUTCOME: VI
MATH OUTCOMES: III, IV

CULTURAL OBJECTIVE:

Students will relate basic geometric shapes to Native American architecture and numerical concepts.

MATH OBJECTIVES:

Students will:

identify common shapes and objects in their environment

match like numbers and groups of objects

compare larger and smaller numbers.

TEACHER'S BACKGROUND INFORMATION:

Native Americans have lived in various types of housing due to the geographical location of the tribes. The Cherokee of the Southeast were farmers and lived in log cabins, because logs were available. The Northern Sioux followed the buffalo and lived in tepees which were easy to carry from place to place. In Iowa, the Masquaki lived in wi-ki-ya-bis. The wi-ki-ya-bis were made up of long poles arched over the ground, tied with strings from a plant and covered with elm bark. Many Navajos still live in six-sided hogans made of logs, branches and mud, with the door facing toward the rising sun in the East.

In Southwest Arizona, the Tohono O'odham (formerly known as the Papago) constructed four-sided homes. They cut tree trunks for the corners, and cut the ribs from cactus for the walls. Grass and mud were then mixed together to fill in between the ribs. The roofs were made from mud and grass. Other homes were made from adobe bricks, roof lumber, and roofing paper.

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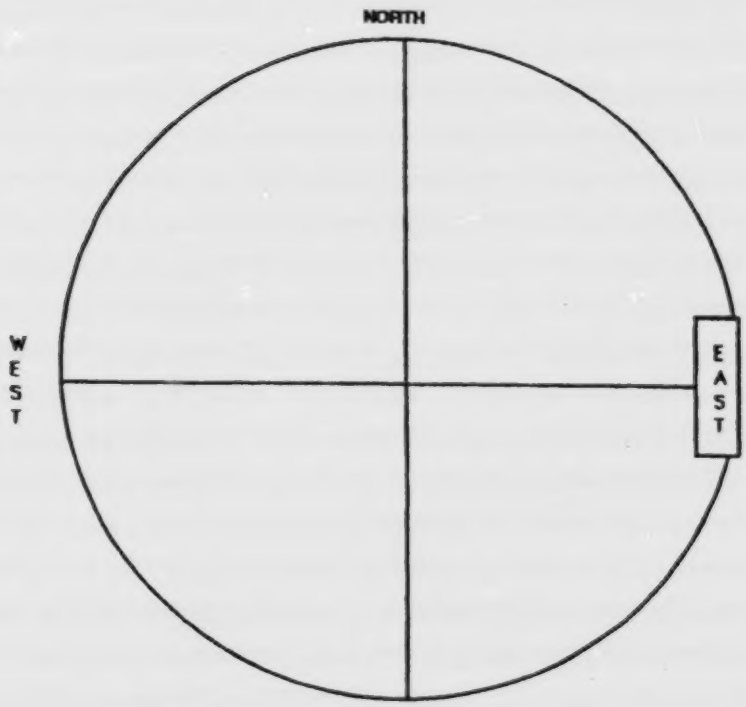
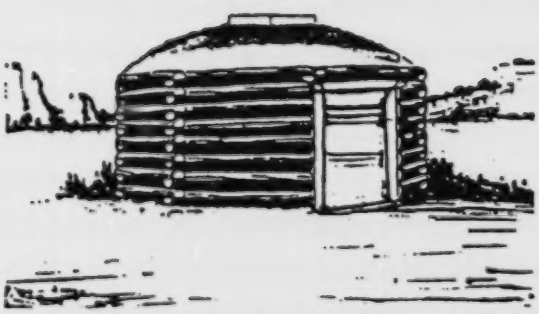
NAVAJO HOGAN DIRECTION





The female hogan.

The male hogan.

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MATH AND SCIENCE --

"NAVAJO HOGAN"

CULTURAL OUTCOME:	**VI**
MATH OUTCOMES:	**IV, VII**
SCIENCE OUTCOMES:	**I, III**

CULTURAL OBJECTIVE:

Students will become aware of their cultural homes and the ways in which the environment affects the type of construction.

MATH OBJECTIVES:

Students will:

orally identify fractional parts (halves, thirds, fourths) of whole objects or sets of objects

name and describe two dimensional shapes

use concrete models of fractions (halves, thirds , fourths, and sixths) to investigate different physical representations for the same fractional parts of whole objects or sets of objects

estimate the number prior to counting and count objects

develop skill in estimating sums and differences.

SCIENCE OBJECTIVES:

Students will:

understand the effects of human behavior upon their environments

name ways that people depend upon plants and animals

describe their impact on the environment

compare characteristics of different plant and animal environments.

TEACHER'S BACKGROUND INFORMATION:

The Navajo dwelling, a hogan, plays an important role in the religious and secular life of the people. Many styles of homes exist on the Navajo Reservation today. The earliest type of hogans are the three-forked pole and the cone-shaped structure. These particular styles are rare and less popular than the six-sided hogan. An eight-sided hogan is becoming popular today.

The circular structure of the hogan is made out of Juniper trees. First a site is located for the hogan. A dirt floor is leveled, then the foundation is laid. Single logs are placed in a circle to begin the construction. Grooves are cut on the ends of each log to secure the walls of the hogan. Logs are tightly fitted and packed with mud or clay on the inside and outside. Roof logs are gradually built in a circular enclosure with a small opening left for the stovepipe. A single door way faces east for the morning sun to greet. The traditional hogan does not have a window.

Upon completion and before the new home is occupied, the hogan is ceremoniously dedicated by a Blessing Way ceremony to assure harmony for those who dwell within.

Today, the Navajos continue to build hogans traditionally. However, with new technology and supplies, hogans are becoming very modern and elaborate with windows, floors, carpet, and electricity.

STUDENT LEARNING ACTIVITIES:

1. Teacher will show pictures of different types of hogans and discuss the similarities and differences.

2. Identify the different shapes found in the hogan's structure.

floor	circle
sides	rectangle
door	rectangle
window	square or rectangle
roof	hemisphere (ball cut in half)
hole in roof	circle or square
stovepipe	cylinder
stove	cube

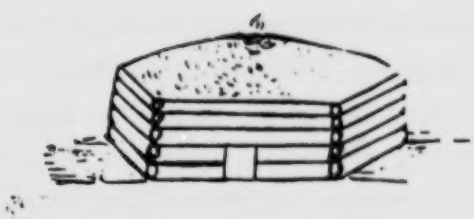
3. Using a circle pattern, trace and cut out a circle. Fold circle in half and discuss the fractional part. Fold again, this time into fourths. Discuss the fractional part of circle and draw a line on the folds to show fourths.

4. Use the above circle to illustrate a hogan floor. Draw a small rectangle to represent a door. Label the remaining three sides with their appropriate directions. (See illustrations)

5. Discuss with students the ways in which the environment plays a part in determiningthe types of hogan built. In the mountains, pine are used. Other areas may use Juniper trees. Discuss what type of hogans their family has and draw a picture of it.

6. Go on a nature walk and identify different types of trees in your area. Discuss and list the uses of trees besides building hogans. Other uses might be: firewood, sap, medicine, dyes, or food.

7. Build a hogan out of popsicle sticks, paper logs, or sticks. Before building, have students estimate how many sticks they need to build their hogan. List each student's estimation on a chart. When hogan is completed, record the actual number of sticks used on the chart and compare the two.



Directions for building a hogan.

1. Draw and cut out a circle using tagboard for the hogan floor.

2. Glue six sticks down on the circle to give the hogan its six sides. (Wood glue is recommended.)

3. Continue adding sticks to each side until the desired height is acheived. Leave a rectangular shaped opening for the door.

4. Draw and cut out a construction paper stove with stovepipe for the hogan.

5. Using construction paper, make a roof. Be sure to cut a hole in the middle for stovepipe opening. Sand may be added to give the earthen look.

6. Make a diorama of the hogan and its surrounding environment. Allow several class periods to build hogan and diorama.

EVALUATION:

1. Observe the students.

2. Have oral discussions about shapes.

3. Give students material to build a hogan.

DEVELOPED BY:

Cindy Henley
Mae Mallahan

Each One Teaches One

Kimberly Eubanks

Profile: Christine Thompson, Teaching Assistant

When Christine was a very little girl, she lived at home with her family. They lived in hogans. A hogan is a small round-shaped house made out of mud and logs. There was only one room in the hogan. In one part was the sleeping area. Everyone in the family slept on sheepskin mats that were rolled up during the day to make more room. On the other side was a loom they used to make rugs and clothes. In the middle was a cook fire with the kitchen area which also kept the room warm in the cold winter. There were no heaters or electric blankets.

Christine's family made money in several ways. They made and grew many things that they could sell or trade for what they needed. One of the most important things they did to earn money was to raise sheep. Even when Christine was very young, she helped care for the sheep.

The sheep were very valuable to their family. The sheep provided meat, wool for making clothes and rugs, and money. Another way Christine's family made money was jewelry making. The family made rings, bracelets, and necklaces out of silver and a beautiful blue stone called turquoise. They could sell or trade the jewelry for food, money, and other items.

The family taught Christine all about the Navajo religion and beliefs. The Medicine Man or Holy Man, who is a spiritual leader, also helped teach. Medicine Men hold a very important job in the community. They help sick people get better, make special blessings, and tell stories from the past.

When Christine got a little older, she went away to school. The school was so far away that she couldn't walk every day. She had to live at a boarding school. She learned from her new teachers at the school about how the White people lived. They taught her how to read and write the English language, her numbers, and how the people outside the reservation lived. Christine was very happy at school. She liked learning new ways to live and speak, but she missed her family.

Christine grew up learning about two very different ways of life, the Navajo way of life and the White way of life. She liked things from both ways. She wanted to help share what she had learned with her people. When she grew up, she did exactly that! She became a teaching assistant at a school for Navajo children on the Navajo Reservation.

She loves working with the children in her class and helps them learn everything they might need to know in order to live in both the Navajo world and the White world.

As a kindergarten teaching assistant her main job is to work with the kindergartners who need extra help with their school work. Christine feels that the most important job she does is the sharing of what she knows about living in both the Navajo world and the White world so that her students can live, work and be happy wherever they choose to live when they grow up. She is teaching what she knows to children, just like her family had done for her.

Social Studies

Building a Hogan

Objective:

Students will build a model of a hogan. They will name and explain items found in this type of Navajo home.

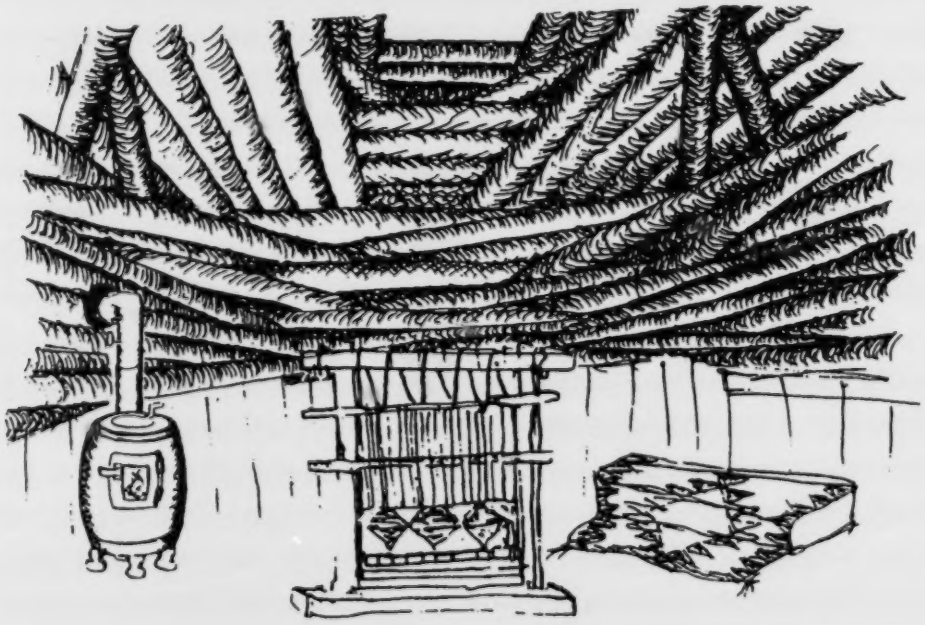
Materials:

- picture of the inside and outside of a hogan
- picture of a stop sign (for shape of hogan)
- drawing paper
- crayons
- construction paper and glue **or** small twigs and string

Procedure:

Look at pictures of hogans. Review the profile of Christine Thompson. Remind students that she lived in a hogan. A hogan is a house that is shaped almost like a circle. It has eight sides like a stop sign. Show the stop sign picture. Draw this on the board. Talk about some of the things that were in Christine's hogan (e.g., loom, cooking utensils, rugs, fire area). People in the hogan slept on sheep skin mats. During the day they rolled them up so that they could have more room.

Have each student draw a hogan. In their hogan they should draw items listed above. Have students explain what is in their hogan and why. Alternatively, have students make a hogan of construction paper tubes rolled around their pencil for form and glued. Alternatively, build a model of a hogan lashing together straight twigs, pencils or dowels with string. Build a diorama with fabric scraps for mats, sticks for fire, and so on inside the hogan.



SCIENCE --

"EARTH LODGES"

CULTURAL OUTCOME: I
SCIENCE OUTCOMES: II, V

CULTURAL OBJECTIVE:

Students will become aware of the importance of the earth lodge and the Arikara people.

SCIENCE OBJECTIVES:

Students will:

gather data

analyze, synthesize, and evaluate information

understand cause and effect relationships

observe that heat energy may be reflected, absorbed, or be transferred through an object.

TEACHER'S BACKGROUND INFORMATION:

The construction of earth lodges was one of great engineering ingenuity. The ability to move poles with great weight and size into some type of frame and foundation without the use of modern equipment was one of great magnitude.

The four poles in the middle of earth lodges represent the number four which has high spiritual significance for the Arikara people and for most Native Americans. The doorway opens to the east so occupants can greet the morning sun as it rises. The earth lodges were built in many sizes, depending on their function. The largest of the earth lodges was built as a community center and for ceremonial purposes.

Earth lodges were a type of shelter that fit best in this type of environment.

STUDENT LEARNING ACTIVITY:

1. Start with student drawing and coloring three basic shapes, the triangle, circle, and rectangle. Have them cut them out and place them on the top of bulletin board in three different categories. Under each category, have each student use magazines to find objects with similar shapes to be put under each category.

2. Have the students divide into groups and place some tinker toys on each table and let them play, experiment, and come up with three shapes that are similar to the three shapes with which we started.

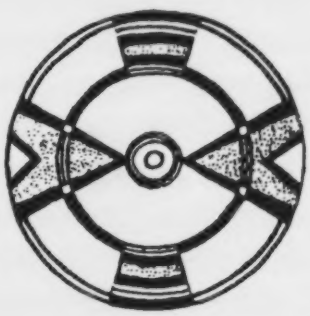
3. Have student make a replica of an earth lodge, a tepee, and a house out of paper mache (see attachment D-1).

4. Have the student build a earth lodge, a tepee, and a house out of material that would be similar to the original materal used. Try to make all three objects similar in size and weight.

5. Place all three replicas on a table and then put a fan on the other end of the table about three feet away. Have the student make predictions as to what will happen when the fan is turned on. Graph the results and the predictions. Have the student reseach and write a paper about aerodynamics and present to the class.

6. Have the student look up the vocablary words: radius, area, volume, and height. Have the student use the three stuctures and find their area, radius, volume,and height.

7. Have the student set up an activity that will show student the heat value of each stucture by using a candle and a thermometer. Place a very small candle into each stucture. (Make sure this is done only with adult supervision.) Place a thermometer inside and record the temperature every minute for change. Graph the results.



D-1

1 Step One

2 Step Two

1. use a clay Base
2. [illegible]

3 Step Three

1 Glue
2 Straw
3 tape

4 Step Four

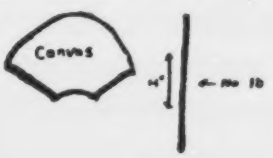
1. flour
2. water
3. Aluminum paper
Mix
4. Shape Mache on Out Side

D 2

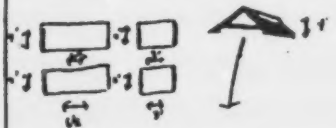
Earth Lodge

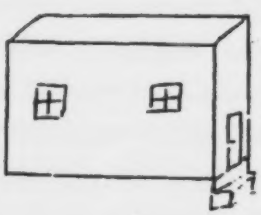
1. Mix clay and dirt
2. then lay a layer of straw or other branches
3. then lay more clay
4. Last add the mud and grass
5. Make sure it has a wood base or clay

Tepee



House





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EVALUATION:

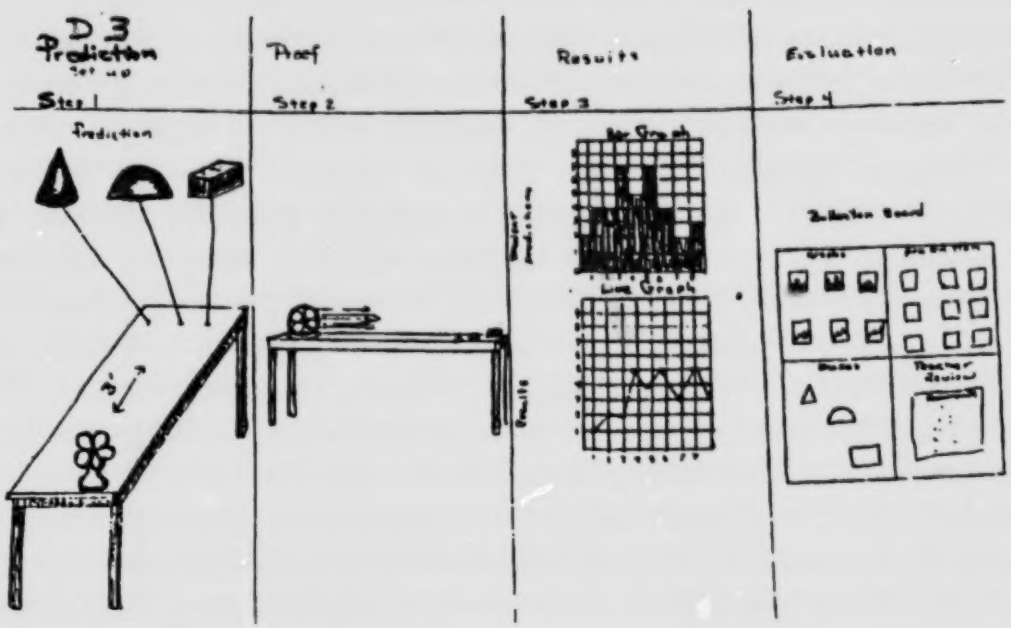
The earth lodge was an important part of the Arikara culture. It not only gave shelter from the elements outside, but it also provided a spiritual oneness with Mother Earth and helped keep the Arikara people in balance and harmony .

RESOURCES:

The Arikara elder, White Shield

DEVELOPED BY:

Don Yellowbird
Mary Wilson
Frances Wabaunsee
Grover Parsons



Math

Teepee Geometry

Objective:

Students will learn practical applications of geometric measurements.

Materials:

- tag board base (8"x8")
- twigs or straws or new pencils
- clay
- string
- construction paper or fabric scraps
- glue

Exploration and Seminar:

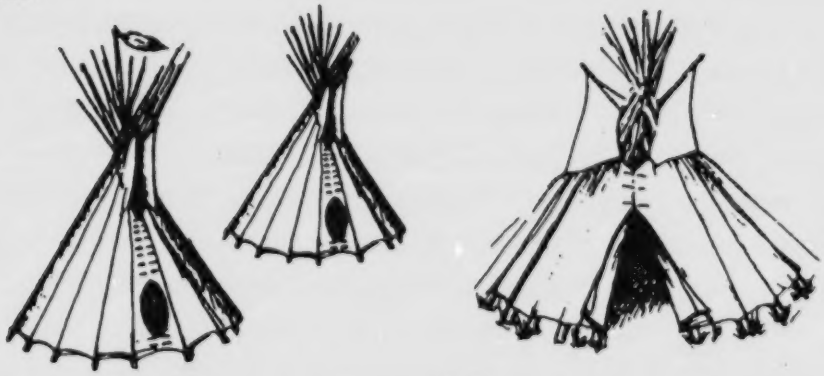
Discuss the following: Indian people chose a circular home rather than a square house. Why do you think they did that?

Invention:

Put vocabulary on chart paper or board to define circumference, radius, diameter of a circle. Advantages of a circular home include: more usable space, easier to set up and take down, pockets to catch rain, less resistance to the wind, warm in the winter and cool in the summer. The circular home was also symbolic of the circle which is important to the Indian people. Using string, show the students how to measure the circumference, diameter and radius of a model teepee. Ask several questions about the measurement of the teepee (e.g: If the radius is 5 inches, what is the diameter?)

Application:

Students will be provided with straws or twigs, string and cloth. They will create their own miniature teepee. First students lash together the twigs at the top. Next, they secure the bottom of the twigs with clay placed in a circle to the tag board base. After finishing the frame, the students drape the cloth over the frame and cut to fit. The fabric may be sewn or glued to the frame. Using a string, each student will measure and record the circumference, diameter and radius of their teepee.



SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN INDIAN HOUSES UNIT –

Standard – Understands the convictions scientists share about the nature of the world and what can be learned about it
Benchmarks-
Understands that the same scientific investigation often gives slightly different results when it is carried out by different persons, or at different times or places; however, if the results of repeated experiments are very different, something must be wrong with the design of the investigation
Understands that scientists often repeat an experiment many times before accepting a consistent result as true

Standard – Understands that scientific inquiry works in particular ways
Benchmarks –
Understands the many forms scientific investigation can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up by evidence

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that written communication is an essential part of doing science
Understands that doing science involves many different kinds of work and many different kinds of people

Standard – Understands basic concepts about the structure of matter
Benchmarks -
Knows that some properties of material may be changed by external actions like heating and cooling, but different materials respond differently to the same actions
Knows that when a new material is made by combining two or more materials, as in a chemical transformation, the material can have properties that are different from the original materials

Standard – Knows the kinds of forces that exist between objects and within atoms
Benchmarks –
Knows that things near the earth are pulled towards it by gravity
Knows that every object exerts gravitational force on every other object, a force that depends on the mass of the objects and their distance from each other

Standard – Understands the cycling of matter and flow of energy through the living environment
Benchmarks –
Knows that some form of energy is needed for any work to be done; for example, food is the fuel and the building material for all organisms

Standard – Knows the characteristics that distinguish the human species from other organisms
Benchmarks –
Knows that people tend to live in families and communities where different people have specialized jobs

Standard – Understands the nature of the Chemical Revolution
Benchmarks –
Knows that fire – along with air, earth, and water – was long believed to be the substance out of which everything else is made; this seems sensible, though no longer believed, because it looks like fire is given off when something burns
Knows that people have long believed that most things must be made up of combinations of just a few basic kinds of things; there has not always been agreement, however, on what those basic kinds of things are and how they combine or can be made to combine to make other things: this is the work of chemistry, materials science and physics

Standard – Understands the nature of physical, conceptual, and mathematical models and the uses made of them
Benchmarks –
Knows that seeing how a model works after something is done to it, such as changing some of its parts, may suggest how the real thing will work if the same is done to it
Knows that geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and even stories can be used to represent objects, events, and processes in the real world, although these representations can never be exact in every detail

Standard – Knows about patterns of change and constancy
Benchmarks –
Knows that things change in steady, repetitive, or irregular ways, or sometimes in more than one way at the same time, and that a table or graph of observations or measurements often is the best way to tell which kinds of change are happening
Knows that a system may stay the same because nothing is happening to it or because the things happening to it exactly counterbalance one another
Knows that physical and biological systems tend to change until they become stable and then remain that way unless their surroundings change

Standard – Understands that the way things work often changes with scale
Benchmarks –
Knows that whenever possible, it is better to rely on measurements, or calculations based on measurements, than to depend on perception alone to estimate the magnitude of things

AMERICAN INDIAN STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN INDIAN HOUSES UNIT –

Science As Inquiry –
Indian students should develop the ability to articulate examples of the scientific inquiry necessary to develop and improve technologies employed by early American Indians, such as arched roof structures.

Physical Science –
Indian students should develop an understanding of how energy was transferred through the use of early tools.

Science and Technology –
Indian students should develop an understanding of the technological design process and how it was applied in the development of various tools and technologies employed by early American Indians, such as building construction technologies.

Indian students should develop an understanding of the benefits and constraints of technological design through an examination of the building materials used in traditional American Indian housing (e.g., Pueblo adobe, Northwest coast planks, hide tipi coverings).

History and Nature of Science –
Indian students should develop an understanding of ways in which reasoning, insight, energy, skill and creativity were demonstrated in the scientific achievements of early American Indians in architecture.

SUN, MOON AND STARS

Teacher's/Parent's Background Information –

Work by "archaeo-astronomers" in scattered areas around this continent has brought into partial focus a picture of ancient Indian societies that suggests a people more knowledgeable and advanced than archaeologists once believed. In particular, it is obvious that Indians had a sophisticated understanding of the sky.

At a site in Wyoming known as Bighorn Medicine Wheel, astronomer John A. Eddy deciphered the arrangement of what appears from the air to be a giant wheel, with spokes, made of stones. Dr. Eddy observed and measured how various combinations of the outer ends of the Bighorn spokes line up to mark the rise and setting of three bright stars which precede it. But Bighorn is just one piece in what is emerging as an elaborate and involved puzzle.

Dr. Eddy, working at the Smithsonian Center for Astrophysics at Harvard University, located other similar solar observatories built by "different people at different times." He has tracked down a series of such wheels dotted around southern central Canada and along the eastern slopes of the Rocky Mountains. He has hinted that spokes in many of the wheels pinpoint the summer solstice and that often a wheel will point to another wheel nearby.

Dr. Eddy has found that some of the wheels date back as far as 2,500 years, while others may be as "recent" as 1,000 A.D. He believes that when more sites are explored, dated and understood they will "clarify a little better" the way in which prehistoric Indians dispersed around the country.

Other work is being carried on which may help in nailing down the exact trails they followed:

> In the Hoven Weep site, just west of Mesa Verde, Colorado, Dr. Ray Williamson, assistant dean at St. Johns College in Annapolis, Maryland, has measured the astronomical orientation of ports in the walls of tower-like structures built by the ancestors of the Pueblo Indians. The ports, or apertures, he says, are oriented in the wall in such a way as to admit the sun only on the winter and summer solstices. Built about the year 1100, Dr. Williams says that the structures show that the Anasazi Indians had a "sophisticated" knowledge of the sun and the planets.
>
> At Cahokia, in East St. Louis, Illinois, Dr. Warren Wittry has explained an extensive series of post holes in the once-thriving Indian capital that dates back to

the 11th century. The holes describe four large circles – one is 410 feet in diameter – which, Dr. Wittry's work indicates, may have been used for the same calendar-like purpose that Stonehenge is thought to have served.

The clincher for Dr. Wittry came when working on the site, a beaker was discovered in a pit where the winter solstice sunrise post would have once stood. On the beaker was a sun symbol design with a four directional cross in the middle. "There is no question in my mind," says Dr. Wittry, "that these sites functioned as solar observatories." The purposes of keeping close tabs on the sun, he said, could have been for measuring the timing and length of agricultural seasons, for ceremonial use, or for a calendar to keep track of delivery and shipments of products to outlying Indian settlements.

In Mexico, on the Yucatan peninsula Dr. Anthony Aveni has studied apertures in a Mayan-built "Caracol," a cylindrical tower which was, and still is, "deadly accurate" in plotting the movements of the planet Venus. Dr. Aveni has studied hundreds of remains throughout Meso-America in search of ceremonial sites which were aligned with astronomical features. And, he says, while it has long been accepted that Indians of Mexico were sun worshippers, their astronomical accuracy is nonetheless astonishing.

"With no everyday need for astronomy in the modern world," says Dr. E. C. Krupp, Director of the Griffith Observatory in Los Angeles, "we may have a hard time realizing today how much prehistoric peoples watched, and relied upon, the sky. The thing you learn from all this is that people seek orientation...they want to know 'Where am I in this world?' Orientation of yourself in space and time is a fundamental human need."

"It's a story," says Dr. Eddy, "which just hasn't been unraveled. But there is more and more evidence that they were all looking at the sky and studying it...We are just scratching the surface." He calls the astronomical/archaelogical sites a "trail of crumbs that we can follow like Hansel and Gretel" back to their ideological beginnings. Dr. Eddy believes that the work already done by archaeo-astronomers is beginning to "tie down pretty nicely" such things as the dispersion of the human race in North America.

from *Observatories 2,500 Years Old* by Mark Stevens for Christian Science Monitor in *American Indians: Science, Medicine and Technology*, Indian Education Act Resource Center I, ORBIS Associates, Washington, DC, 1986.

LITERATURE FOR SUN, MOON AND STARS UNIT–

The Daughter of the Sun (**Cherokee**), The Girl Who Married the Star (**Lakota**) , and The Man Who Married the Moon (**Pueblo**) in Favorite North American Indian Legends by Philip Smith, Dover, 1994.

Sunpainters: Eclipse of the **Navajo** Sun by Baje Whitethorne **(Indian Author)**, Northland Press.

Dream Feather by Viento Stan Padilla (**Indian Author**), Book Pub., 1987.

Grandmother Spider Brings the Sun by Geri Keams **(Indian Author). Cherokee**

How Coyote Helped to Light the World by Anne B. Fisher. **Pomo**

Brave Eagle's Account of the Fetterman Fight by Paul Goble. **Lakota** A battle takes place on the night the moon is closest to the earth.

Full Moons: Indian Legends of the Seasons by Lillian Budd.

Thirteen Moons on Turtle's Back by Joseph Bruchac (**Indian Author**), Paperstar, 1992.

Moonstick: Seasons of the Sioux by Bunting and Sandford, Harpercollins, 1999. **Lakota**

Snow Moon, Wild Goose Moon and Wild Rice Moon, Circle Program, Fitzhenry & Whiteside, 1988.

Keeping Track of Time in Signs of Tradition: Native American Lessons, Masters Project, University of Kansas, 1994. **Mayan and Mandan**

Full Worm Moon by Margo Lemieux (**Indian Author**). **Algonquin**

Circle of Seasons by Ann Nolan Clark, Bureau of Indian Affairs. **Pueblo**

Red Hawk and the Sky Sisters, A **Shawnee** Legend by Gloria Dominic, Troll, 1996.

Lakota Star Knowledge by Ronald Goodman, Sinte Gleska University, 1992.

The Stars in Old Father Storyteller by Pablita Valarde (**Indian Author**), Clear Light Pub., 1989. **Pueblo**

Murdo's Story: A Legend from Northern Manitoba by Murdo Scribe (**Indian Author**), Pemmican Pub. (How Fisher became the Big Dipper)

Lift the Sky Up: A **Snohomish** Indian Legend by Richard Vaughn, 1995.

Oot-Kwah-Tah, The Seven Star Dancers, **Onondaga**, How Grizzly Climbed the Mountain, **Shoshone**, and Creation of the Moon, **Navajo**, in Keepers of the Night by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1994.

How Fisher Went to the Skyland, **Anishinabe**, Spring Defeats Winter, **Seneca**, How Grandmother Spider Stole the Sun, **Creek**, and How Coyote Was the Moon, **Kalispel-Idaho**, in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988.

Native American Stories by Joseph Bruchac (**Indian Author**). Includes the same stories as Keepers of the Earth.

All on Earth, Musical Companion to Keepers Books, performed by Michael Caduto.

How the Milky Way Got Into the Sky (**Warm Springs**), How the Morning and Evening Stars Came to Be (**Assiniboine**), How Daylight Came to Be (**Skokomish**), Educational Systems, Inc.

Skywoman: Legends of the **Iroquois** by Joanne Shenandoah and D. George, Clear Light, 1998.

Star Stories by Linda Skinner (**Indian Author**).

Stars in **Navajo** Tales.

Earth and Sky by R. A. Williamson

Earth Magic, Sky Magic by Rosalind Kerven.

Stars of the First People by Dorcas S. Miller, Pruett, Pub., 1997.

They Dance in the Sky, Native American Star Myths by Jean G. Monroe and Ray A. Williamson, Houghton Mifflin, 1987.

Star Tales, North American Indian Stories and More Star Tales, North American Indian Stories by Gretchen Mayo, Walker & Co.

American Indian Star Tales by L. Moroney, Feathermoon. Also on audio tape.

The Earth Under Sky Bear's Feet by Joseph Bruchac (**Indian Author**), Putnam & Grosset, 1995. Twelve poems about the Big Dipper. **Mohawk, Anishinabe, Pima, Missisquoi, Winnebago, Cochiti Pueblo, Lenape, Chumash, Lakota, Navajo, Pawnee**

CHECK YOUR LIBRARY OR BOOKSTORES FOR OTHER BOOKS RELATING TO THE TOPIC.

ACTIVITIES FOR SUN, MOON AND STARS UNIT –

1. Provide introductory information on how advanced Indians' knowledge of the sun, moon and stars was long ago.

2. Have the students read legends about the sun, moon and stars, retell and respond to them.

3. Have the students research and find legends about the sun, moon and stars from their own tribe(s). Determine their accuracy by verifying with elders. Can they be told at this time?

4. Have the students read poems about the sun, moon and stars, memorize and recite those that may be from their own tribe(s).

5. Research and discuss Indians' knowledge of astronomy.

6. Research and discuss Indian astronaut, John Herrington, of the Chickasaw tribe.

7. Discuss Indians' closeness to and observance of nature.

8. Have students do a sun watching activity and keep a record. Calculate findings.

9. Have students do a moon watching activity and keep a record. Calculate findings.

10. Have students do a star watching activity and keep a record. Calculate findings.

11. Have students research to find where the site of the nearest Indian observatory is.

12. Have students chart the sun, moon and stars from their observations.

13. Have the students do research to learn the distances from the earth to the sun and moon.

14. Have a local Indian elder visit the class and tell what he knows of tribal knowledge of the sun, moon and stars. Discuss how the cycles of the sun and moon affected and may still affect tribal agriculture and ceremonies.

15. Have students do presentations with visuals about what they have learned.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University or through the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

SCIENCE --

"THE SOURCE OF LIFE"

CULTURAL OUTCOME: II
SCIENCE OUTCOME: III

CULTURAL OBJECTIVE:

Students will learn about Native American legends and beliefs in regard to the cosmos.

SCIENCE OBJECTIVES:

Students will:

identify life processes common to all living things

describe plant growth and adaptations to their environment.

TEACHER'S BACKGROUND INFORMATION:

The Creek legend of "How Grandmother Spider Stole the Sun" is a good introduction to the Native American concept of the inter-connectedness of all life.

"HOW GRANDMOTHER SPIDER STOLE THE SUN"

When the earth was created, the people and animals were in darkness. Finally, the animals gathered together and decided to do something about it. Bear spoke up and said, "I have heard there is something called the Sun. It is kept on the other side of the Earth, but the people there will not share it. I believe we can sneak over there and steal a piece of it."

Every one of the animals agreed it was a good idea. The big question was who would be the one to go and steal the Sun. The first one to try was the Fox. He crept to the place where the Sun was kept. When no one was looking, he grabbed a piece of it in his mouth and ran. But the Sun was so hot, it burned his mouth and he dropped it. That is why to this day foxes have black mouths because the first fox burned his mouth carrying the Sun.

The next animal to try was the Possum. Possums, during that time, had bushy tails. So, the Possum sneaked up to the place where the Sun was kept, snipped off a piece, and hid it in her tail. Then she ran, taking the Sun back to the animals and people. She lost her grip on the Sun when it started to burn away all the hair on her tail. To this day, all possums have bare tails because the Sun burned away the hair on that first possum.

Finally, Grandmother Spider tried. She was smart and clever. Instead of trying to hold the Sun herself, she wove a bag out of webbing. She put the piece of the Sun into her bag and brought it back to her people. The big question now was where to put the Sun.

Grandmother Spider felt it should be high in the sky so everyone would be able to see it and benefit from the light.

The animals agreed, but not one could reach high enough to place it there. They thought about taking it to the top of the tallest tree, but that wouldn't be high enough for everyone on the Earth to see the Sun. They decided that one of the birds could easily carry the Sun to the tip of the sky. Buzzard volunteered to go since he could fly higher than any bird.

Buzzard placed the Sun on top of his head where his feathers were the thickest, for the Sun was still very hot, even inside Grandmother Spider's bag. He flew higher and higher. The Sun grew hotter and hotter. The higher he flew, the hotter the Sun became. The Sun began burning through Grandmother Spider's bag, but Buzzard just kept flying. Up and up he went and the Sun grew hotter. The Sun was burning away the feathers on top of his head, but he continued on. Now all his feathers were gone, but he continued to fly upwards. His skin on his head began to turn red, but he continued to fly. He flew until he reached the top of the sky where he placed the Sun so it would give light to everyone.

Buzzard was honored by all the birds and animals because of his heroic deed of placing the Sun in the sky. Even though his head was naked and ugly because he was burned carrying the Sun, he is still the highest flyer of all. He can be seen circling the Sun to this day. Since Grandmother Spider brought the Sun in her bag of webbing, the Sun honors her by making rays across the sky which are shaped like the rays in Grandmother Spider's web.

These rays are there to remind everyone of what Grandmother Spider did for all the animals and the people. They also remind us that we are all connected like the strands of Grandmother Spider's web.

Adapted from Michael J. Caduto and Joseph Bruchac. Keepers of the Earth, Native American Stories and Environmental Activities for Children.

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STUDENT LEARNING ACTIVITIES:

1. Read the story about grandmother spider and discuss the following questions:

   a. What happens to Fox and Possum when they try to carry the Sun? How does Grandmother Spider succeed in bringing the Sun to the dark side of Earth?

   b. What does the story explain about the Fox's mouth, the Possum's tail and the Buzzard's head?

   c. Buzzard makes a great sacrifice to place the Sun high in the sky. What is this sacrifice? What would you do in Buzzard's situation?

   d. Why do the Indians have a story about the Sun?

   e. Could we live without the Sun? Why not? What are the most important things that the Sun gives to us?

   f. What do plants use and produce during photosynthesis?

   g. What would happen to the animals if green plants were gone?

   h. What causes night and day? How long is each day?

2. Discuss the following concepts about the natural world:

   a. The sun's energy supports life.

   b. Plants are producers of energy for animals.

   c. Some animal life does not need sunlight. There are bacteria and a few highly specialized marine animals living near hot springs deep in the sea, such as 10-foot long (3 meters) tube worms and giant clams and crabs.

   d. The photosynthesis formula is:

      water + carbon dioxide + chlorophyll (green pigment in leaves) in the presence of sunlight = oxygen + nutrients (simple sugars, starches, fats, proteins, vitamins, etc.) + water.

   e. Herbivores, carnivores, omnivores, scavengers, and saprophytes are consumers of energy from plants.

f. Energy flows from the Sun to the plants and animals.

g. A simple food chain would be: seeds--mouse--red-tailed hawk.

h. A food web consists of many simple food chains. One example of this is the web surrounding the mouse family since they also eat grass and other plant parts and, in turn, are eaten by many different animals.

i. The Sun doesn't shine constantly on the green plants that produce our food supply. The cycle of night and day, which affects all life, results from the Earth's rotation on its axis. Someone standing at the equator is moving at the speed of more than 1,000 miles (1,609 kilometers) every hour.

3. Play "SUN CIRCLE" on a sunny day, using a whole orange and one chilled and peeled orange section for each student. Form a circle and use the oranges to symbolize the Sun. Discuss the many gifts that we receive from the Sun. Ask the students to think about the important things that the Sun provides for us, such as food, energy, heat, and light. Suggest ways in which Native Americans show appreciation and respect for these gifts.

a. Students stand in a circle with their eyes closed.

b. Students hold one of their hands open, palm up, in front of their eyes.

c. Take the chilled orange sections or pieces of other bright, sunshine-like fruit and place one in each waiting hand.

d. Once someone has guessed correctly, instruct the students to open their eyes, but not to eat the orange yet.

e. Hold up a whole orange and ask what it could symbolize. After noting the resemblance to the sun, let the students eat their orange slices.

f. Remind the students that it is the food energy created from sunlight by plants that enables people to do this or any other activity.

4. Play "VORED TO DEATH" with the following materials: scavenger hunt cards, pencils, 5 x 7 inch file cards, string to hang the cards around the students' necks, field guides for background information on common plants and animals, and a drawing of a food pyramid composed of local animals.

Before starting the lesson, prepare scavenger hunt cards listing plants, animals, and signs of animals living in an habitat nearby, such as a field, forest, or pond. Examples include grass, milkweed, a maple tree, grasshopper, cricket, mouse, deer, swallow, pigeon, fox, and hawk. Leave room on the cards for students to write in their own discoveries.

a. Have students work in small groups of two or three when you go outside on the scavenger hunt using the cards that you have prepared.

b. Ask the students to look for, but not collect, the plants and animals. The students will place marks next to those things on the list that they find and write in any new sightings.

c. After about ten minutes, collect the students and have each group report on what they have found. If they report on anything interesting or exciting, all the students can be taken to that area.

d. Groups will then write the names of plants and animals found on separate file cards.

e. Define and discuss the concepts of photosynthesis, energy producers, and some major kinds of consumers: herbivores, carnivores, and omnivores.

f. Use field guides to define concepts.

g. Classify each animal as herbivore, carnivore, or omnivore.

h. Have the students write the appropriate classification on the back of each note card.

i. Separate the students into groups of six. Each group needs six cards labeled with plant and animal names: three plants and three animals (two herbivores and one carnivore or omnivore).

j. Tell the students that each animal is one kind of 'Vore' that eats other living things and that in any field, forest, or pond, the plants and animals are being 'Vored to Death."

k. Describe how energy is used for heat, growth, and work as the animals feed and are active in other ways. Because the available energy is diminished as it moves along the food chain, plants can only support so many herbivores and even fewer carnivores. That is why each group in this activity has only one carnivore. Use a drawing of a food chain constructed from the animals found near the home to make your point.

l. Explain the concept of food pyramid to the students. To reinforce this lesson, have each group of six make a pyramid with the three plants on the bottom, the herbivores(and in some cases, a herbivore and an omnivore) on the second level and the carnivore on top.

m. Combine groups to make still larger pyramids. While they are in the pyramid shape and beginning with the students on the bottom, have them introduce themselves, explaining the kind of "Vores" that they are and the roles they play in the food pyramids.

n. Ask the students what would happen if someone came along and took all the plants away.

o. Pull a "plant" out from under one of the small pyramids and see what happens, but be careful because the students will come tumbling down.

5. Play "AS THE WORLD TURNS" to demonstrate the causes of day and night by using a flashlight and globe. The students will be able to visualize how the Earth's rotation on its axis brings night and day as the different regions of the Earth become exposed alternately to sunlight and shadow.

a. Equip the flashlight with a tube to focus the beam.

b. Mark the spot on the globe where your town or city is located. If using the beach ball to represent the Earth, mark any place about one-third of the way down from the uppermost point. Put the ball in a large salad bowl and place at on a Lazy Susan or other suitable rotating stand.

c. Darken the room and focus the beam onto one side of the "Earth" while someone slowly turns the globe and creates "night" and "day."

d. Point to a location on the map and watch that spot move from light to dark and back again as the World turns.

EVALUATION:

1. Assign a brief essay on the students' choice of one of the following topics:

    a. The concept of energy flow among plants and animals.

    b. Use of photosynthesis and sunlight in growing the green plants that are the primary food for animals.

    c. The importance of the Sun and its provision of food, energy, heat, and light.

    d. The concepts of producer, consumer, food chain, and food pyramids.

2. Ask students to discuss the concept of photosynthesis.

3. Have students draw a picture of a simple food chain.

4. Question students about the importance of the Sun and its provision of food, energy, heat, and light.

5. Have students demonstrate their understanding of the concepts of producer, consumer, food chain, and food pyramids by making a collage on poster board.

6. Ask students to identify and classify herbivores, carnivores, and omnivores on a simple chart.

7. Encourage students to discuss their visualization of how the Earth's rotation on its axis brings night and day as the different regions of the Earth becomes exposed alternately to sunlight and shadow.

RESOURCES:

Bruchac, Joseph and Caduto Michael. Keepers of the Earth. Golden, Colorado: Fulcrum, 1989.

Mallinson, George et al. Silver Burdett Science Text. Morristown, Pennsylvania: Silver, Burdett, 1987.

DEVELOPED BY:

Iris Jean Butchee

The Sunkeepers

As Native Americans, we see the sun as our main source of life, without which we cannot survive.

Through it, we see happiness, growth and the knowledge we get from our Creator.

MATH AND SCIENCE --

"CLOCKS AND CALENDARS"

CULTURAL OUTCOMES:	**II, V,**
MATH OUTCOMES:	**VI, VIII**
SCIENCE OUTCOME:	**II**

CULTURAL OBJECTIVE:

Students will learn about some traditional Native American concepts of time and the seasons.

MATH OBJECTIVES:

The student will:

tell time to the minute/second

make simple picture, bar, and line graphs.

SCIENCE OBJECTIVES:

The student will:

use observation skills

use classification techniques

make simple predictions

analyze data.

TEACHER'S BACKGROUND INFORMATION:

Introduce a lesson on clocks and calendars by sharing this Seneca-Northeast Woodlands Indians legend with the class:

"SPRING DEFEATS WINTER"

This story is about Old Man Winter with his long white hair. Wherever he stepped on the ground, it grew hard as a stone. Finally, he found a place where he could set up his lodge. The walls of his lodge were made of ice and covered with snow. He and his friend, Northwind, would sit in front of the fire, which gave off strange flickering light, but no heat. One day, there was a knock on the door.

"Go away," shouted the Old Man, and as he turned to walk away, the door of the lodge fell to the ground. A smiling young man entered and stirred the fire with his green stick. It began to grow warm inside the lodge.

The Old Man began to sweat and grew angrier because he knew he couldn't scare the young man away. The Old Man opened his mouth to speak, but no words came out. He grew smaller as sweat poured from his brow. He disappeared as the walls of his lodge caved in on him. Finally, Spring had won over Winter.

Adapted from Caduto, and Burchac, Keepers of the Earth, pp. 129-131.

STUDENT LEARNING ACTIVITIES:

1. Discuss the story about spring and winter and describe what Old Man Winter looks like. Ask students why they think that the ground turned into stone when he stepped on it and why the two men did not sit in front of a real fire? Describe what Spring and Winter looked like in their human forms.

2. Make a chart for students to record the temperature twice daily (preferably early morning and afternoon). Record the difference in the temperatures.

3. Construct a clock on the bulletin board. Ask a variety of time questions on separate cards (i.e. show the time on the clock and ask for the numerical time or give the numerical time and ask for a picture of the clock face).

4. Provide sufficient celsius thermometers, containers of ice and containers of water so that students can work in small groups. Have students place thermometers in the water and record the temperature, then place the thermometers in the ice and record that temperature. Ask students to discuss the difference in degrees.

5. Show the students two annual calendars, the Julian and the Miamian. Compare and contrast the two calendars, then ask students to develop a seasonal division for each.

MIAMI INDIAN CALENDAR

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EVALUATION:

Ask students to perform the following activities:

1. Discuss and compute the difference in the morning and afternoon temperatures.

2. State and record the time to the nearest minute/second

3. Identify the temperature at the boiling point and freezing point of water and be able to express the experiment.

4. Differentiate between the Miami Tribal calendar and the Julian calendar even though the names of the months and divisions of the seasons are the same.

RESOURCES:

Caduto, Michael J. and Burchac, Joseph. Keepers of the Earth: Native American Stories and Environmental Activities for Children. Golden, Colorado: Fulcrum, 1989, pp.129-130.

The American Indian Institute. Legacy of the American Indian: Lessons For The Classroom. Norman, Oklahoma: University of Oklahoma, Continuing Education and Public Services.

DEVELOPED BY:

Marcella Ben Vaughn

SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN SUN, MOON AND STARS UNIT –

Standard – Understands that scientific inquiry works in particular ways
Benchmarks –
Understands the many forms scientific investigation can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up by evidence

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that written communication is an essential part of doing science
Understands that doing science involves many different kinds of work and many different kinds of people

Standard - Understands essential ideas about the composition and structure of the universe and the motions of objects in it
Benchmarks –
Understands that while telescopes magnify distant objects in the sky (like the moon and planets) and dramatically increase the number of stars we can see, some objects are so distant, small or dim that they do not appear in a telescope
Understands that astronomical objects in interstellar space are unimaginably distant from the earth and each other: stars are like our sun, but so distant they look like points of light, and galaxies, though very large, are so distant they look like a single star
Knows that the sun is a medium-size star, located at the edge of a disk-shaped galaxy, part of which can be seen on a clear night as a glowing band of light
Knows that the universe contains innumerable galaxies, each containing innumerable stars
Understands that the earth is one of several planets that circle the sun, and the moon circles around the earth

Standard – Knows basic concepts about the earth
Benchmarks –
Knows that like all planets and stars, the earth is approximately spherical in shape
Knows that the rotation of the earth on its axis every 24 hours produces the night and day cycle

Standard – Knows the main features of the Copernican Revolution –
Benchmarks –
Knows that a few "stars" called planets, over time appear to change their position in the sky relative to the general pattern of stars.

AMERICAN INDIAN SCIENCE STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN SUN, MOON AND STARS UNIT –

Earth and Space Science -
Indian students should develop an understanding of the regular and predictable motion of the sun and moon and the places and ways in which American Indians observed them and how they employed their observations, e.g., in agricultural and ceremonial cycles.

Science in Personal and Social Perspectives –
Indian students should develop an understanding of American Indian past and contemporary contributions to science and technology.

History and Nature of Science –
Indian students should develop an understanding of examples of Indian men and women with diverse interests, talents, qualities and motivations who currently engage in the activities of science, engineering and related fields such as Indian astronaut John Herrington of the Chickasaw Tribe.

American Indian Content Standards, ORBIS Associates for the Office of Indian Education Programs, Bureau of Indian Affairs, 1996.

INDIAN FOODS

Teacher's/Parent's Background Information -

Many of the most widely used and important foods known in the United States today are of American Indian origin. They are sold in supermarkets, enjoyed every day, and often prepared in the original way. Such classic American dishes as barbecue, steamed lobster, succotash, spoon bread, cranberry sauce, and mincemeat pie, are inherited from the first Americans. Until the white man came to America, the rest of the world knew nothing of such foods as avocados, sweet or Irish potatoes, pineapples, tomatoes, peppers, pumpkins or squashes, maple sugar, and, of course, corn. Without corn, which most Indians regarded as a gift to be treasured and surrounded with ceremony, the colonization of America might have faltered. The wild rice of the Great Lakes region, which is now considered a gourmet delicacy, is still harvested by the Chippewa. To a considerable extent, religious customs and beliefs determined what foods were eaten and how they were prepared.

Most Indians preferred cooked food to raw, and they had many methods of cooking and seasoning their food. Among the methods used were stoneboiling (putting hot stones into a basket or pot of water), drying, freezing, and smoking. The various cooking methods obviously affected pottery and basketry types. Flavoring was accomplished by the use of seeds, roots, flowers, and grasses. The north Pacific tribes used the tender inner bark of hemlock and spruce. In the southwest, mesquite beans, cactus and yucca fruits, and the agave were important.

Five distinct areas provide the Indian foods and recipes we use today. In the southwest, the Pueblo tribes, the Tohono O'odham (Bean People), and the Hopis grew peppers and beans which were made into savory chili, soups, guacamole and barbecue sauces. Along the northwest coast, seafood was the staple, and here women of the Tlingit, Kwakiutl, Salish, and other tribes steamed and broiled salmon and dozens of other fish and seafood from the Pacific and the western rivers. On the vast plains, nomadic tribes such as the Sioux and Cheyenne roasted buffalo over campfires. In the South, Cherokees and other tribes had long enjoyed an impressive list of fragrant soups and rich stews, and they baked the same assortment of corn breads known today. Two particular American favorites, the clambake and Boston baked beans, were also staple favorites of the Narragansetts, Penobscots, and Powhatans, who, like the Iroquois and other timber people of the east, steamed their dinners in earthen pits. Their method, still in use today, is now called "fireless cooking."

From all these regions, American Indians have bequeathed varied, imaginative and indispensable dishes. American Indian cuisine may rightly be considered continental cooking, indigenous and uniquely North American.

- Bureau of Indian Affairs

INDIAN FOOD

In North America, native people have utilized over 2,000 species of plants for food. At least 19 of these plants had to be cultivated, such as corn, beans, squash, tomatoes, avocados and peppers. Horticultural techniques are credited by scientists to have been more advanced in the Americas than they were in Europe. For example, 250 different kinds of potatoes were planted by Inca farmers; only one of which, the "super potato," was used in Ireland.

Indian people learned that by planting beans and corn (and sometimes, squash) together, the crops would thereby be larger and healthier. This is due to the fact that the nitrogen, needed by corn, was generated by the beans' roots. Corn, beans and squash are sometimes referred to as the "three sisters." The use of fish as fertilizer by burying it in he soil also brought about improvement in crop yield. When Indian people rotated crops, they found that they could improve the quality and/or size of plants.

Some foods required special preparation. Acorns were boiled or roasted and the oil extracted for cooking. Acorns and certain roots were made edible by boiling them in lye-water made from the ashes of a hardwood tree such as ash or oak. Acorns and roots could then be soaked in fresh water to remove the lye and added to stews or pounded into meal for bread.

In addition wild plants such as burdock, dandelion, milkweed, mushrooms, berries, wild rice and nuts were also used for food.

In fact, the same plant could be used for many different purposes. In the corn plant, tubes from the stalk were used for medicine; husks for kindling and as tapers for carrying fire; husks for weaving mats, baskets and moccasins; corn silk for medicine; corn cobs for smoking hides; dried corn kernels for beads and decoration; green corn leaves for bandages; and, of course, corn is a very nutritious "high yield" food.

from *Science and Cultural Curricula,* Indian Education Act Resource and Evaluation Center One, ORBIS Associates, Washington, DC, 1986.

This unit should be used around Thanksgiving time.

LITERATURE FOR INDIAN FOODS UNIT-

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Ininatig's Gift of Sugar: Traditional Native Sugarmaking by Laura Waterman Wittstock **(Indian Author)**, We Are Still Here: Native Americans Today, Lerner.

Manabozho and the Maple Trees, **Anishinabe**, and The Coming of Corn, **Cherokee**, in Keepers of the Earth by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum Pub., 1988.

The Maple Thanksgiving by Joseph Bruchac **(Indian Author)**.

The Popcorn Book by Tomie DePaola.

Four Seasons of Corn: A **Winnebago** Tradition by Sally M. Hunter **(Indian Author)**, We Are Still Here: Native Americans Today, Lerner, 1992.

Mon Daw Min – the Origin of Indian Corn in **Ojibway** Indian Legends by Cheryl Mills King, North Michigan University Press, 1972. .

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Corn for the Palace by Margaret Crary and Carroll Voss, Prentice-Hall. **Lakota**

Why Corn Is Golden by V. Blackmore, Little, Brown, 1984.

The Thanks to Trees, **Seneca**, The Corn Spirit, **Tuscarora**, The People of Maize, **Mayan**, and Waynabozho and the Wild Rice, **Ojibwa**, in Keepers of Life by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum Pub., 1998.

The Sacred Harvest: **Ojibway** Wild Rice Gathering, We Are Still Here: Native Americans Today **(Indian Author)**, Lerner.

Tomatoes, Potatoes, Corn and Beans by Sylvia S. Johnson.

The Amazing Potato by Milton Meltzer.

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First Woman and the Strawberry by Gloria Dominic, Troll. **Cherokee**

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Buffalo Bird Woman's Garden as told to Gilbert Wilson. **Hidatsa**

Walking His Talk in Signs of Tradition, Masters Project, Univ. of Kansas,1994. **Mandan**

Indian Summer in Keepers of Life by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1998. **Penobscot**

Sunflower's Promise by Gloria Dominic, Troll, 1996. **Zuni**

Indian Harvests by William C. Grimm, McGraw, 1973.

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How Food Was Given by Jeanette Armstrong **(Indian Author)**, Theytus Books. **Okanagan**

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Indian Cookin' by Herb Walker.

Clambake: A **Wampanoag** Tradition by Russell Peters **(Indian Author)**, We Are Still Here: Native Americans Today, Lerner.

Native American Cookbook by Edna Henry **(Indian Author)**, Messner, 1983.

Native American Book of Life by White Deer of Autumn.

CHECK YOUR LIBRARY OR BOOKSTORES FOR OTHER BOOKS ON THIS TOPIC.

ACTIVITIES FOR INDIAN FOODS UNIT –

1. Have the students read about Indian foods, summarize and report their findings.

2. Have the students read Indian legends about food, retell them and respond to them.

3. Have the students read poems about Indian foods and thanksgiving, memorize and recite them for others.

4. Provide introductory information on foods introduced by Indian people.

5. Have the students learn which foods their local tribe(s) planted and utilized.

6. Have the students learn the planting and harvesting techniques of the local tribe(s). Discuss the fact that Indian gardening techniques were adopted by white people.

7. Have the students learn how their local tribe(s) stored and cooked their foods.

8. Discuss Indian foods eaten now and have Indian elders come to assist in the preparation of Indian foods. Figure the cost of the meal.

9. Have the students learn how many of the foods in a Thanksgiving meal were domesticated by Indians. Have the students read and discuss the Thanksgiving stories and their authenticity.

10. Have the students learn the nutritional and medicinal value of Indian foods. Classify Indian foods into the food groups.

11. Have the students make and eat popcorn for a nutritious snack. Sell it to other students.

12. Have the students plant a traditional garden or grow plants indoors.

13. Have students learn the names of foods introduced by Indians in their Native language(s). Have them note that some foods have Indian names: potato, squash.

14. Have the students make corn husk dolls, seed pictures with colored corn (Discuss the Corn Palace in Mitchell, SD), a collage of Indian foods from magazine pictures.

15. Have the students prepare and give presentations on what they have learned.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University or through the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

MATH AND SCIENCE --

"THE NATURE OF CORN"

CULTURAL OUTCOME:	**X**
MATH OUTCOMES:	**VII, VIII**
SCIENCE OUTCOME:	**II**

CULTURAL OBJECTIVE:

Students will understand and appreciate the importance of corn to the Native American peoples.

MATH OBJECTIVES:

Students will:

estimate quantities by using standard measurement

construct simple line or bar graphs, tables, and charts

read and interpret a given set of information contained in a table, graph, or chart.

SCIENCE OBJECTIVES:

Students will:

gather data

understand and apply information and concepts

analyze, synthesize, and evaluate information.

TEACHER'S BACKGROUND INFORMATION:

Corn is one of the most ancient cultivated crops in the world. It has been grown as a food source by native Meso-Americans for at least 5,000 to 8,000 years.

Early Native Americans were very aware of the different strains of corn. They identified and cultivated approximately 120 different strain types. The people of the desert southwest selected only those types that were drought resistant and insect-resistant, while Native people from the north chose strains with shorter growing seasons.

Of particular note is the unique character of corn. Corn is an extremely compact grain so that it provides more nutrients in less space than any other type of plant grains. For example, corn contains Vitamin C, whereas wheat does not. Both people and animals are capable of surviving on corn alone.

The corn known to early Indians was a hybrid of two wild grasses. Jemez Indians of New Mexico like to show visitors a cane-like, tasseled grass that grows in Frijoles Canyon at Bandolier and have been known to say, "From this plant we got corn."

Iroquois tribes from the northeast speak of Spirit Woman who walked across the field as corn and pumpkins sprouted from her footprints. Whatever the legend, Indians everywhere hold corn sacred, a gift from the gods or beneficent spirits, to be surrounded with ceremony.

Zuni Pueblo of New Mexico, one of the legendary Seven Cities of Cibola, did not have the coffers of gold the Spaniards sought. The Pueblo had a golden treasure more valuable than coins and jewels: corn, pumpkins, and squash. These gifts meant far more to starving, struggling settlers than any precious metal.

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STUDENT LEARNING ACTIVITIES:

1. Use an ear of Indian corn per group or individual student to sort and count the kernels of corn by color. Graph their results with colored pencils.

2. Bring several ears of Indian corn to class and ask students to compute and record statistical data about the corn. Use the sample worksheet provided below.

   a. Estimate the number of kernels on an entire ear.

   b. Estimate the number of rows.

   c. Estimate the number of kernels on a row.

   d. Multiply the estimated numbers of kernels and rows to get a second estimate of the total number of kernels.

   e. Count the number of kernels on a row.

   f. Count the number of rows on the entire ear.

   g. Multiply the counted number on kernels by the number of rows to get a closer estimate of the total number of kernels on their ear of corn.

   h. Count the number of kernels on the entire ear of corn.

   i. Graph their estimates and the actual total.

   j. Compare the three estimates and the actual number of total kernels on their ear.

   k. Discuss and compare the findings.

   l. Ask for alternate methods for computing the number of kernels on an ear of corn. For example, count the number of kernels in a circle around the ear, and then multiply by the number of circles (kernels in a row) on the ear.

HOW MANY KERNELS ON AN EAR OF CORN?

COMPUTATION WORKSHEET

1. First estimate _____

2. (Estimated) number of rows _____

X

3. (Estimated) number of kernels on a row _____

=

4. Second estimate _____

5. (Counted) number of rows _____

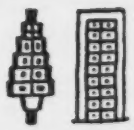
X

6. (Counted) number of kernels on a row _____

=

7. Third estimate _____

8. Actual number of kernels on an ear _____



60

3. Make Berry Corn Cobbler. Using the following recipe, gather and arrange the ingredients needed in the cobbler. Students will convert the recipe for the needed number of servings, then measure the ingredients and mix them together. Students will test, evaluate, and discuss the flavor and texture of the cobbler to determine if the recipe should be altered.

BERRY CORN COBBLER

Filling

1quart	fresh strawberries or cherries (slice strawberries in half)
1/2 cup	sugar

Topping

1 cup	corn meal
1/4	cup sugar
1 teaspoon	baking powder
1 teaspoon	salt
1/2 cup	sour milk
2 tablespoons	melted butter or margarine

Sauce

1/4 cup	honey
1 tablespoon	melted butter or margarine
1 tablespoon	lemon juice

Place berries in a 2-quart baking dish, and sprinkle with sugar. For the topping, mix together all dry ingredients, then quickly stir in the milk and melted butter or margarine. Drop batter by the tablespoon on top of berries, forming a design of rounds. Mix together sauce ingredients, and pour over batter and exposed berries. Bake at 375° F. for one hour. Serve at room temperature.

(Makes 6 servings)

EVALUATION:

1. Students estimate the number of kernels on an ear of corn.
2. Compare students' estimated number of kernels with actual computations.
3. Ask students to describe the difference between estimates and factual computations.
4. Have students determine if each ear of corn has the same number of rows.

RESOURCES:

Kimball, Yeffe and Jean Anderson. The Art of American Indian Cooking. Garden City, N.Y: Doubleday and Company, 1965, pp. 157-158.

DEVELOPED BY:

Elaine Hendricks
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Renata Griego
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Don Yellowbird
Mary Wilson
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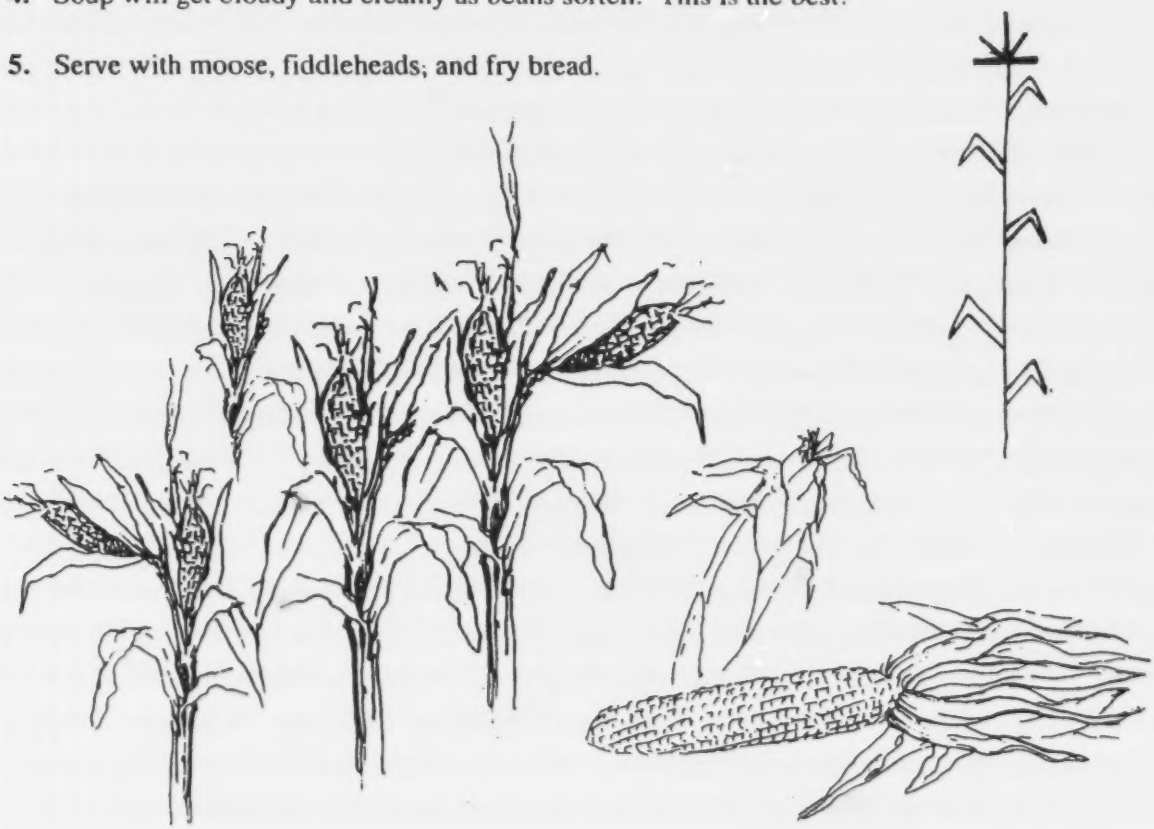
Penobscot Hull Corn Soup

Ingredients

1 bag soldier beans (may substitute yellow eye or navy beans)
1 can hull corn (also called white or yellow hominy)
salt pork

Instructions

1. Wash beans and soak 1/2 bag (1 pound) of beans overnight in water.
2. Add water to cover beans again and parboil (until skin on beans cracks when blown upon).
3. Drain this water and replace with fresh water, add can of hull corn (drained) and small pieces of salt pork, bring to a boil, then simmer for several hours to taste.
4. Soup will get cloudy and creamy as beans soften. This is the best!
5. Serve with moose, fiddleheads; and fry bread.



Recipes
of
Traditional Foods

Penobscot Indian Fry Bread

source: Mildred P. Akins

Ingredients

1 package of dry yeast (quick rising is okay)
2 - 3 cups warm water
2 tablespoons instant potatoes
1 heaping tablespoon sugar
1 pinch salt
1 cup melted lard
5 - 6 cups flour

Instructions

1. **Dissolve** yeast in 1 cup warm water (not too hot) and **set aside**.
2. To a large bowl, **add** 2 tablespoons instant potatoes, sugar, salt, and melted lard and **mix**.
3. **Add** yeast/water mixture to the dry mixture and additional cups of water.
4. Gradually **add** enough flour to make a bread dough (not sticky) and **let rise**.
5. **Break off** bread in chunks, **make a patty** and **fry in lard**.
6. **Serve** warm with molasses and **enjoy**!

Science

How To Get a Rise Out of Yeast

Objective:

Students will be able to explain what makes breads rise.

Materials:

- quart sized bottles (two for each group of four to five students)
- water
- one-half cup sugar (per group)
- yeast (one packet per group)
- balloons (two or three per group)
- bowls
- spoons
- cooking oil or lard
- frying pan
- electric burner
- fork
- measuring cups

Advanced Preparation:

About thirty minutes prior to the lesson have students fill bottle halfway full with tepid water. If water is too cold, the yeast won't react. If water is too hot, the yeast will be killed. Add a quarter cup of sugar to both bottles per group and a packet of yeast to only one of each group's bottles. Shake the bottles to mix. Cap each bottle with a balloon.

Exploration:

Divide into groups of four or five to observe their two bottles, one with yeast and one without yeast. Ask the students why they think one is bubbling and one is not. Allow them to observe.

Seminar:

Within each group the students will discuss what they observe. The teacher will then ask each group for their answers. Questions to be asked:

What is happening?
Is the same thing happening in each bottle?
Do the balloons look the same now as they did when you started looking at them?
Did all groups see the same thing?
What is different about what we put into the bottles?
Could that have something to do with what is happening?

Invention:

Yeast is a living thing. It is almost too small to see. It is a type of a plant called a fungus. What do plants need to survive? They get their energy from the soil and sunlight. Yeast gets its energy from sugar. It is almost as if the yeast "eats" the sugar and gets energy just like you get energy for running and playing from your food. When yeast gets energy from sugar, it makes a gas called carbon dioxide. The gas it makes can't be seen. The gas fills the balloon and makes it get bigger. Yeast in bread dough makes gas, too. The gas gets trapped in the bread dough as tiny bubbles. The yeast in bread causes the dough to puff up, so it makes the bread rise or get bigger and fluffier.

Application:

Christine's family makes fry bread to eat all the time. She uses yeast to make it rise and get bigger and fluffier. See fry bread recipe in table of contents. Observe the bread rise. You may choose to either bake or fry it.

Extension:

Bring in refried beans, lettuce, tomatoes, salsa, green chilies, shredded cheese and black olives. Have students prepare for themselves a Navajo taco for lunch.

Round loaves of bread are baked in "horno" ovens in pueblos of the Southwest.

MATH AND SCIENCE --

IRRIGATION

CULTURAL OUTCOMES: I, II, VI
MATH OUTCOMES: VIII
SCIENCE OUTCOMES: I, II, IV, V

CULTURAL OBJECTIVE:

Students will demonstrate a knowledge of how irrigation was used in their native culture.

MATH OBJECTIVES:

Students will:

make simple line/graphs, tables, and charts to communicate data

read and interpret picture, bar, line and pie graphs.

SCIENCE OBJECTIVES:

Students will:

learn how science affects their lives

identify ways to practice conservation in their own environment

list types of pollution, their cause and their impact on the environment

identify and describe surface features of the earth

describe how force affects motion and work.

TEACHER'S BACKGROUND INFORMATION:

Among the southwest farmers, the Hohokam exercised the greatest irrigation skills. They constructed major systems of irrigation canals that stretched for 150 or more miles. The longest single canal extended approximately fourteen miles, measured thirty feet from crown to crown of each bank, and reached depths of ten feet or more.

Although the Hohokam did not have modern surveying equipment, they apparently had an understanding of the principles of irrigation. We cannot be certain about their construction of their irrigation projects, but it undoubtedly involved simple gravity flow, as they used their engineering abilities to make the water flow where they needed it.

Canal building was not easy, it must have been excruciatingly hard work, because their implements were handleless stone hoes, ironwood digging sticks, cottonwood spades, and baskets.

Although the Hohokam probably constructed these canals over a period of time, they apparently built them without the aid of highly centralized hydraulic society, even though the repair of leaks and the dredging of silt probably required some sort of organized communal effort.

Hohokam built brush and sand dikes or weirs to channel the water from the river into main canals. If the canals began to leak, they used adobe to patch the seepage area, then they burned brush on top of the clay to harden the clay. This indicates the technical ability of the Hohokam to solve problems associated with irrigation agriculture. Today, this ancient principle can be seen where modern irrigation canals are lined with concrete.

Although Indian agriculture underwent fundamental change, these farmers maintained many traditional techniques, and continued to pass that knowledge on from generation to generation.

Nevertheless, their technical feat in constructing such extensive canals is remarkable, and no other Indians surpassed their engineering techniques until the nineteenth century.

STUDENT LEARNING ACTIVITIES:

1. The purpose of this activity is to develop an awareness of the irrigation process including the flow and elevation of a river source and land requiring irrigation.

   Step l: Using a large flat pan with sides three to four inches high, fill the pan with two inches of sand. Level the sand. Create a river base across the pan with clay or a similar substance so the water will not dissipate into the sand. This will be your river base.

Step 2: Identify two plots of land for students to irrigate. Have students decide what will be necessary to irrigate their land. Once they have identified what they need, let them experiment. (You may also consider using the outdoors following step 2.)

2. Have students write a journal for the Irrigation unit, using construction paper, markers, colored pencils, and looseleaf note paper.

3. Have students brainstorm the importance of water and define the word *irrigation*. Record all their responses on a chart labeled "What we know about water and irrigation." When completed, review the chart with the students and ask them to write in their journal about water and how it is used for irrigation. Students may share their writing with a partner or group.

4. Have students design a farming tool that makes the best digging/cutting instrument using only wood. Students should share their digging instruments with the class. All students will demonstrate their digging instruments outdoors. Students may illustrate their tool in their journal.

5. Students should compare and contrast daily use of water with past water use.

6. Students can conduct research and do a drawing of their state waterways. The drawing shows the uses of water for their area.

7. Have students do another chart labeled "What we want to know about irrigation." Record student questions on a chart, leave enough space for students to record their answers as they find them.

8. Students discuss the issue of water rights. Who owns the water that farmers use? How does that affect our daily water needs? Can we do anything to conserve our water? Have students enter their answers and ideas in their journal.

9. Write an imaginary story about being a Hohokam farmer. Record the story in their journal.

10. Have students create sounds of an imaginary rain storm and tape sounds on an audio cassette.

11. Math activities:

Students will keep a journal of their daily use of water in a school setting. They will tally each time they use the drinking fountain, everytime they flush, and every time they use the sink for personal hygiene. Students will tally up all their information the following day. The class will make a bar graph using this information. Then as a class

they will estimate how much water they would use in 2 days, 3 days, and 4 days. On the third day the class will graph their estimations.

Students could also keep track of their actual use of water and do a graph which depicts their estimated and actual use through side by side bar graphs.

EVALUATION:

1. Students will be evaluated through teacher observations on how well they have constructed their irrigation system.

2. The teacher will observe the tools that were constructed and used by students.

3. Students will be evaluated orally over their knowledge of the present and past usage of water.

4. Students will be assessed over their sketches or drawings of their state waterways.

5. Student's knowledge regarding irrigation systems will be evaluated through their journal writing and illustrations.

6. Student graphs and measurement data to determine the daily water consumption will also be used to evaluate their understanding of information presented in graph form.

7. Students may self-evaluate their learning of irrigation systems through the data they have recorded on the charts, in their journals, and other pieces of writing.

8. Students could do a final individual poster/chart labeled What I Have Learned About Irrigation Systems.

RESOURCES:

Hurt, Douglas, R. (1987) Indian Agriculture in America. University Press of Kansas. pp.20 - 26.

DEVELOPED BY:

Renee Sears
Earl Vermillion
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SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN INDIAN FOODS UNIT -

Standard – Understands the convictions scientists share about the nature of the world and what can be learned about it
Benchmarks –
Understands that the same scientific investigation often gives slightly different results when it is carried out by different persons, or at different times or places; however, if the results of repeated experiments are very different, something must be wrong with the design of the investigation
Understands that scientists often repeat an experiment many times before accepting a consistent result as true

Standard – Understands that scientific inquiry works in particular ways
Benchmarks –
Understands the many forms scientific investigation can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up by evidence

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that written communication is an essential part of doing science
Understands that doing science involves many different kinds of work and many different kinds of people

Standard – Understands the processes that shape the surface of the earth and the relation of the surface of the earth to the living environment
Benchmarks –
Knows that waves, wind, water, and ice change the earth's surface to produce many of the landforms, such as shorelines, cliffs, deserts, and valleys (wind and water can move soil, depositing it downstream in seasonal layers)
Knows that soil is made partly from weathered rock and partly from products of plants and animals

Standard – Knows about the diversity and unity that characterize life
Benchmarks –
Knows that living things can be sorted into groups in many ways using various properties to decide which things belong to which group
Knows that plants and animals are alive and go through predictable life cycles, which include growth, development, reproduction and death

Standard – Knows the general structure and functions of cells in organisms
Benchmarks –
Knows that tiny living creatures exist that we usually can see only through a microscope

Standard – Understands how species depend on one another and on the environment for survival
Benchmarks –
Knows that plants and animal species depend on each other to maintain life, e.g., many plants depend on animals for carrying their pollen to other plants or dispersing their seeds

Standard – Understands the cycling of matter and flow of energy through the living environment
Benchmarks –
Knows that all animals' food can be traced back to plants
Knows that some source of "energy" is needed for any work to be done; for example, food is the fuel and the building material for all organisms

Standard – Understands the basic concepts of the evolution of species
Benchmarks –
Knows that living things of the same kind vary among individuals, and sometimes the differences give individuals an important advantage in surviving and reproduction
Knows that cultivated plants result from selective breeding for particular traits

Standard – Understands the conditions necessary for maintaining good physical health and why they are necessary
Benchmarks –
Knows that food provides "energy" and essential materials, like vitamins and minerals, for growth and repair of body parts
Knows that "germs" may cause harm if they enter the body, which has defenses such as tears, saliva, skin, blood cells and stomach secretions; if the body is healthy, it can fight germs that do get inside

Standard – Understands how germ theory differs from earlier notions about what causes illness and how germs were discovered and linked to disease
Benchmarks –
Knows that cleanliness and care in the handling of food help people to keep from getting sick

Standard – Knows about patterns of change and constancy
Benchmarks –
Knows that things change in steady, repetitive, or irregular ways, or sometimes in more than one way at the same time, and that a table or graph of observations or measurements often is the best way to tell which kinds of change are happening
Knows that a system may stay the same because nothing is happening to it or because the things happening to it exactly counterbalance one another

AMERICAN INDIAN STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN INDIAN FOODS UNIT-

Science As Inquiry-
Indian students should develop the ability to articulate examples of the scientific inquiry necessary to develop and improve technologies employed by early American Indians such as corn agriculture.

Life Science-
Indian students should develop an understanding of the ecosystems knowledge evident in the American Indian agricultural practices of companion planting and fertilization.

Earth Science-
Indian students should develop an understanding of the regular and predictable motion of the sun and moon and the places and ways in which American Indians observed them and how they employed their observations, e.g., in agricultural and ceremonial cycles.

Science and Technology-
Indian students should develop the ability to speculate about and describe the intended benefits and unintended consequences of early American Indian technologies such as corn agriculture.

Science in Personal and Social Perspectives-
Indian students should develop an understanding of American Indian past and contemporary contributions to science and technology in agriculture.

History and Nature of Science-
Indian students should develop an understanding of examples of Indian men and woman with diverse interests, talents, qualities and motivations who currently engage in the activities of science and related fields.

American Indian Content Standards, ORBIS Associates for Office of Indian Education Programs, Bureau of Indian Affairs, 1996.

THE CYCLE OF LIFE

Teacher's/Parent's Background Information –

In the past, animals were important to Indians for food and clothing purposes and sometimes for shelter. Animal parts were used for tools and utensils. Animal behavior was watched for predicting weather. Animals were, and are, a vital part of the cycle of life.

When the Indian people killed a buffalo, for example, they used every part of him. They did not waste any part. The respect for the buffalo and for the land he grazed on was very important. Without that respect the buffalo would not have been able to thrive, and then the whole way of life would be changed for the Plains Indians.

Until the middle of the last century, the lives of the Plains Indians were totally interwoven with the life of the migrating buffalo herds. The buffalo provided a wonderful assortment of gifts for people to use. Some of the gifts were food, clothing, shelter, musical instruments, games, tools and weapons, cooking pots, and carrying bags.

Before Indians got horses, the Plains tribes followed the buffalo by foot. They used dogs to carry their goods. The horse changed the way that Plains tribes hunted buffalo. Their lives changed greatly with the coming of the horse. They rode these sturdy horses on buffalo hunts and during battle. Indians loved their horses and took good care of them. They were skillful riders, too. The horses were so important to them that they thought ot them as part of the family.

Today many Indian people are ranchers and use the horse to help them in the raising of cattle or sheep. They have learned how to best take care of these animals and to care for the land necessary to raise them.

Indian people view birds and animals as part of the sacred cycle of life. Indians'view of the world is symbolized by the sacred circle, i.e., the life cycle, the cycle of seasons, the roundness of the sun and the moon and their orbital movements. All things work as a part of the circle and, therefore, are sacred and must be treated with respect. In addition, the earth is regarded as a mother which gives life to all things.

In the study of birds and animals in science lessons, teachers should emphasize birds and animals from their local areas. The fact that Indian people respect birds and animals and think of them as equals, or as relatives, should be stressed. Indian people recognize the importance of birds and animals and acknowledge their individual behavior characteristics. These are depicted in the many legends about animals in all tribal cultures. These legends should be included as part of the science curriculum.

LITERATURE FOR CYCLE OF LIFE UNIT -

Stories involving birds in **Hopi** Coyote Tales by Ekkehart Malotki (**Indian Author**), University of Nebraska Press, 1984.

Grandmother's Pigeon by Louise Erdrich **(Indian Author)**, Hyperion, 1999. **Ojibwa**

How the Robin Came To Be in **Ojibway** Legends by Cheryl M. King, North Michigan University Press, 1972.

The First Flute, **Lakota**, and Manabozho and the Woodpecker, **Anishinabe,** Octupus and Raven, **Northwest**, in Keepers of the Animals by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1997.

How Raven Made the Tides, **Tsimshian**, and How Turtle Flew South for the Winter, **Dakota**, in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1988.

How the Redbirds Got Their Color in Wolf Tales by Mary Powell.

Sacred Song of the Hermit Thrush, A Native American Legend by Tehanetorens (**Indian Author**), Book Publishing Co. **Mohawk**

Song of the Hermit Thrush by Gloria Dominic, Troll, 1996. **Iroquois**

A Man Called Raven by Richard Van Camp, 1997. **Northwest**

Crow and Weasel by Barry Lopez.

Supper for Crow: A **Northwest** Coast Indian Tale by Pierr Morgan, 1995.

Eagles – Hunters of the Sky by Ann C. Cooper,Wonder Series.

The Old Beaver Woman and the Eagle, The Drake and the Falcon and The Rattlesnake and the Meadowlark Family and The Crane in **Lakota** and Dakota Animal Wisdom Stories by Mark W. McGinnis, Tipi Press, 1994.

Hawk, poem by Simon Ortiz (Indian Author). **Pueblo**

Hawk, I'm Your Brother by Byrd Baylor, Aladdin, 1976. **Southwest**

Crow and Hawk: A Traditional **Pueblo** Indian Story by Michael Rosen, 1995.

How Coyote Helped to Light the World by Anne B. Fisher. **Pomo**

Iktomi and the Buzzard by Paul Goble. **Lakota**

Hopi Coyote Tales by Ekkehart Malotki (Indian Author), University of Nebraska Press, 1984.

Coyote and Native American Folk Tales by Joe Hayes.

Navajo Coyote Tales by William Morgan (**Indian Author**), Ancient City Press, 1988.

Navajo Coyote Tales by Berard Haile, University of Nebraska Press, 1984.

Coyote Stories for Children by Susan Strauss.

Wolf Tales, Native American Children's Stories by Mary Powell.

Coyote stories in Earth Lodge Tales from the Upper Missouri by Douglas Parks and others, University of Mary, Bismarck, ND, 1978. **Mandan, Hidatsa, Arikara**

Silver Fox and Coyote Create Earth, **Miwok**, How People Hunted the Moose, **Cree**, and Why Coyote Has Yellow Eyes, **Hopi**, in Keepers of the Animals by Michael Caduto and Joseph Bruchac (Indian Author), Philomel.

Dream Wolf by Paul Goble, Bradbury Press, 1990. **Plains**

The Friendly Wolf by Paul Goble, Bradbury, 1974. **Plains**

Bear by E.K. Caldwell (**Indian Author**), Scholastic Books.

The Boy Who Lived With the Bears by Joseph Bruchac (**Indian Author**), Harper Collins. **Iroquois**

Cherokee Animal Stories by George F. Scheer.

Nihancan's Feast of Beaver, Animal Tales of the North American Indians by Edward Lavitt and Robert McDowell, Museum of New Mexico Press, 1990.

Story Cards of North American Indian Tales by Susan J. Clark. Includes plants and animals in Keepers books.

Gifts of the Buffalo Nation by Intertribal Bison Cooperative, South Dakota. **Plains**

People of the Buffalo by Maria Campbell (**Indian Author**), Firefly Press, 1983. **Plains**

The Buffalo Jump by Peter Roop, Rising Moon, 1996. **Plains**

Buffalo Hunt by R. Freedman, Holiday House, 1998. **Plains**

Where the Buffaloes Begin by Olaf Baker, Puffin Books, 1981. **Blackfeet**

Awi Usdi, the Little Deer in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1988. **Cherokee**

How the Fawn Got Its Spots in Keepers of the Animals by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1997. **Dakota**

The Year of the Three-Legged Deer by E. Clifford, Dell, 1972.

The Two-Legged Creature by Anna Lee Walters (**Indian Author**), Northland Pub. **Otoe**

Fox Song by Joseph Bruchac (**Indian Author**).

Beyond the Ridge by Paul Goble.

The Great Change by White Deer of Autumn.

The Origin of Death in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1988. **Blackfeet**

The Earth on Turtle's Back in Keepers of the Earth by Michael Caduto and Joseph Bruchac (Indian Author), Fulcrum, 1988.

Song of the Wild Violets by Peggy Thompson, Book Pub. Co.

CHECK YOUR LIBRARY AND BOOKSTORES FOR OTHER BOOKS ON THIS TOPIC.

"HOW THE BUTTERFLIES CAME TO BE"

Long ago, Earth-Maker formed the earth. He then made Iitoi, our Elder Brother. It was spring.

Iitoi was walking around and saw some children playing. When he thought of how the children would grow old and die, he became very sad. He knew the flowers and trees would also fade. He knew the days would grow short and the nights would turn cold.

Suddenly, Elder Brother had an idea! He would create something to make children happy. He placed many things in a bag - brightly-colored flowers, fallen leaves, yellow pollen, white cornmeal, and green pine needles. Then he added some shining gold that he caught from the sunlight. He listened to the birds that were singing in the trees around him. He took some of their songs and placed them in the bag.

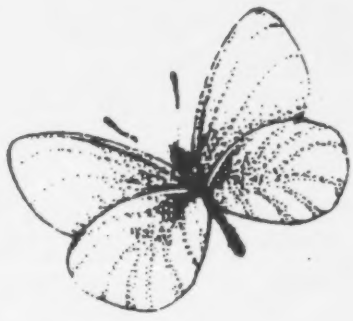
Then he called the children to gather round. He said, "I have something for you."

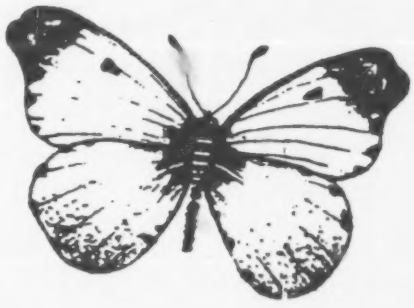
The little children opened the bag and butterflies flew out. Their wings were brightly colored. All the colors that Iitoi had put into the bag reflected in beautiful butterflies.

The children were happy as they watched the butterflies fluttering overhead. But as the butterflies were singing, the birds pleaded with Iitoi to give them back their songs. So Iitoi decided that the songs really did belong to the birds and not the butterflies.

From that day on, butterflies dance and flutter but they do not sing. They are silent.

Adapted from Keepers of the Earth, pp 83-94.





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ACTIVITIES FOR CYCLE OF LIFE UNIT –

1. Provide the introductory information on the cycle of life from the teacher's background information.

2. Have the students read legends about birds and animals and respond and retell them if appropriate. If the legends are from the local tribe(s), have the students determine their accuracy and authenticity or have them find legends from the local tribe(s). Can they be told at this time?

3. Have the students read fiction about birds and animals and respond and compare and contrast them.

4. Have the students read nonfiction about birds and animals, summarize and report findings. What kinds of scientists/environmentalists work with birds and animals?

5. Have the students learn about birds and the cycles of their lives, from eggs to death.

6. Have students learn about birds that are raptors or animals that are predators, such as coyotes and wolves, and how they fit into the cycle of life.

7. Have students learn about Indian people's dependence upon the buffalo and the deer in the cycle of life.

8. Have students read Indian views of death and the cycle of life.

9. Have local Indian elders visit the classroom and explain the cycle of life from their perspectives. Have them explain how disease nearly wiped out some Indian people.

10. Have students figure the ages at death of various famous people from the dates of their births and deaths.

11. Have students write papers about how they are dependent upon others and upon nature.

12. Have students make medicine wheels or other symbols to depict the circle of life.

13. Have the students determine other cycles or circular objects that affect their lives.

14. Have the students give presentations with visuals on what they have learned.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University of through the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Review the science standards for this unit. They will suggest further math and science activities. Also utilize the activities in the *Keepers* books.

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SCIENCE --

"BUTTERFLIES"

CULTURAL OUTCOME: X
SCIENCE OUTCOME: III

CULTURAL OBJECTIVE:

Students will discover that some living beings in our universe undergo a metamorphosis or biological change that often goes unnoticed by the human eye.

SCIENCE OBJECTIVES:

Students will:

name ways that people depend on animals

understand insect life cycles.

TEACHER'S BACKGROUND INFORMATION:

Students will read "How the Butterflies Came to Be", a Papago (Tohono O'odham) myth from Keepers of the Animals.

Students will read "Butterfly Helps the Holy People" which is included. (see attachment)

DISCUSSION

Discuss insect anatomy. Have students show make tagboard cutouts of larger-than-lifesize models - color and hang from the ceiling. Insects can be found in every part of the world and make up two-thirds of the total number of animals in existence. In North America alone, there are over 88,600 species of insects. (The ant species alone account for between 10 and 15 percent of the weight of all terrestrial animal life.)

Insects are used in medicine; they pollinate crops and flowers; they make silk, beeswax (used in lip balm), honey, shellac, and many other products that we use; they are food for other animals; they provide beauty in their colors and sound.

Although insects can be a nuisance and we might sometimes wish they would go away, imagine and predict how life would differ in a world where there were no insects.

STUDENT LEARNING ACTIVITIES:

1. Students will listen to the story, "Butterfly Helps the Holy People." (see attachment) Students will discuss the parts of the story that describe each step of change in the cycle and then correlate this myth with the scientific version of the butterfly metamorphosis.

2. Let students use play dough, pipe cleaners, water colors, yarns, etc., to make the 4 different stages of egg, larva, pupa (chrysalis), and adult.

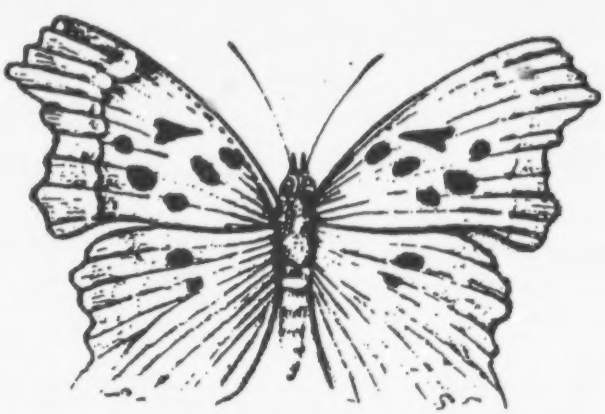
3. Students can travel through the maze to help the butterfly find his winter home.

EVALUATION:

1. Ask questions:

   How many body parts does an insect have? Name them.
   How many legs?
   How many stages in the butterfly life cycle? Name them.
   What kinds of insects live in YOUR home?

2. Create a special gift to give back to the insects in return for all the gifts they give us.



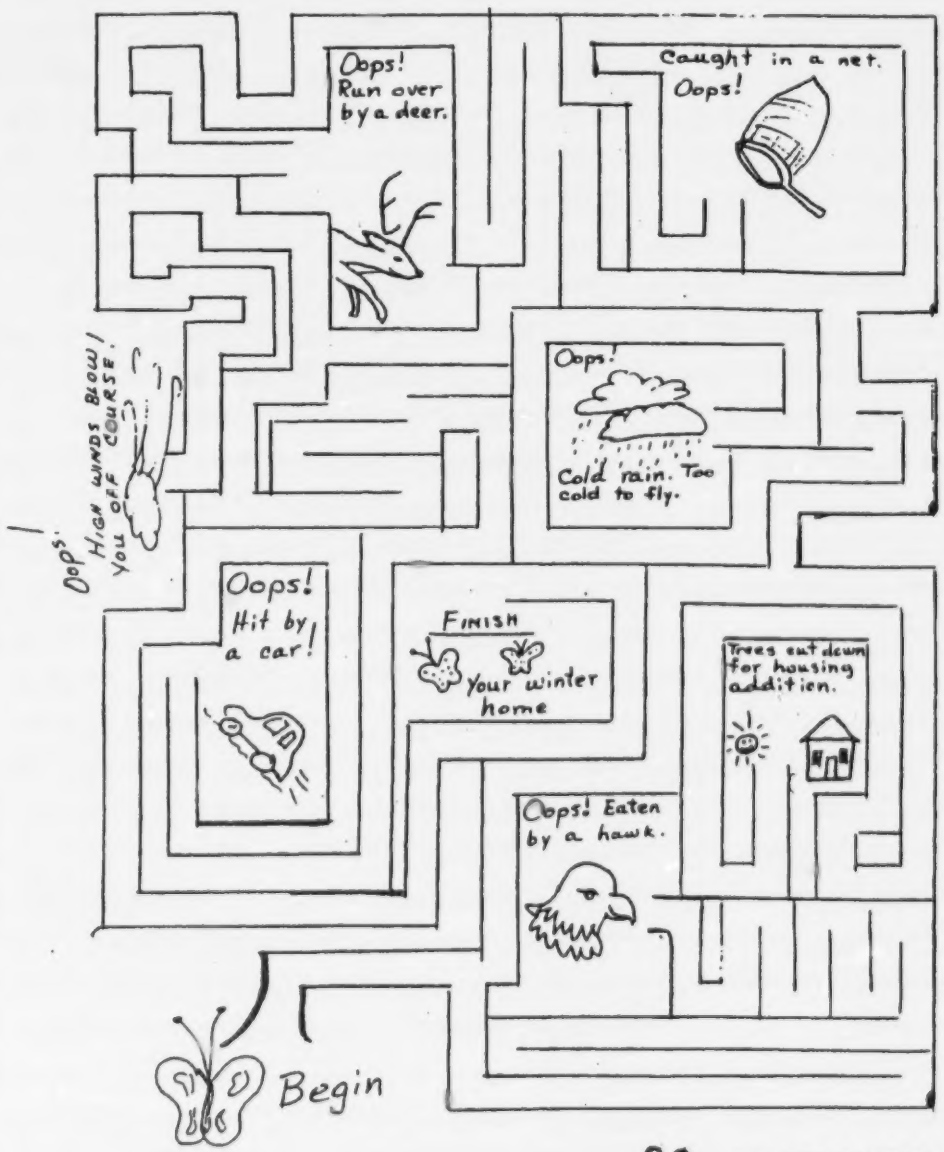
RESOURCES:

Caduto, Michael J. and Burchac, Joseph. Keepers of the Animals: Native American Stories and Wildlife Activities for Children. Golden, Colorado: Fulcrum. 1991, pp. 83-94.

"Butterfly Helps the Holy People," taken from 11th Annual National Native American First Nations Cultural Curriculum Development Workshop, 1991.

DEVELOPED BY

Jeri Stevens


Oops! Run over by a deer.
Caught in a net. Oops!
Oops! HIGH WINDS BLOW! YOU OFF COURSE!
Oops! Cold rain. Too cold to fly.
Oops! Hit by a car!
FINISH Your winter home
Trees cut down for housing addition.
Oops! Eaten by a hawk.
Begin

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"BUTTERFLY HELPS THE HOLY PEOPLE"

The Holy People (Din'e Diyinni) came together on Ch'ool'ii, a sacred mountain in the east. They came together to create a horse.

There were twelve holy people that came from different sacred places. Each brought their medicine pouch that contained sacred pollens, herbs, and flints.

On the first day they built a sweathouse in which they performed a ceremony to purify their thoughts. They bathed, sang, prayed, and made offerings. On the second day they began to mold the body of the horse. Each holy person offered a sacred item from their medicine pouch and placed it on the body of the horse. Once the body was molded and shaped, the horse was given air to breathe and water to make the internal organs function.

The horse came alive. It was able to see, hear, smell, taste, and feel, but the horse was unable to move from its tracks. It was like being stuck in a deep mud. The holy people asked each other if all the right things were added and placed in the right way. They were unable to figure out what the problem was.

On the third day, the horse was alive, but still unable to move. The holy people were puzzled as to why the horse would not walk or run. While the holy people were discussing the problem, there came a caterpillar crawling across the earth where the holy people were sitting in a circle. One of the holy people saw the tiny insect and asked, "Perhaps our small friend can give us some suggestions to solve our problem." The rest of the holy people greeted the caterpillar. They told him of their problems.

The caterpillar listened, and slowly crawled around the large horse. It bent down and snorted as he crawled in front. Finally he said, "I know of a way to make your horse move and to make it walk and run. But I myself have difficulty with moving around. As you can see, it will take me a long, long time to go home and bring back the things that will make the horse move."

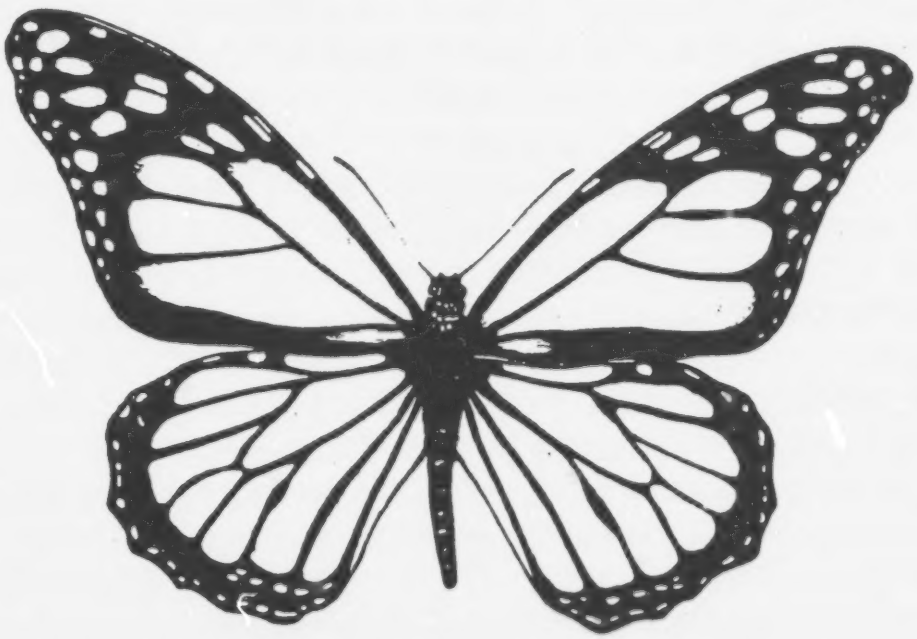
One of the holy people stepped forward and offered to help the caterpillar. He reached up into the sky and brought down a strand of rainbow and gave it to the caterpillar. He told the caterpillar to spin himself in the rainbow and make a bundle (cocoon). After the caterpillar wrapped himself, the holy people sang four songs. At the end of the fourth song, a butterfly came out of the rainbow bundle (cocoon). The caterpillar had transformed into a beautiful butterfly, and had flown off towards his homeland.

On the fourth day, the butterfly came back to Ch'ool'ii with four stripped obsidian flints. He instructed the holy people to sing a song during the application of this medicine. Then the butterfly placed the flints at the bottom of each foot of the horse. Then he fluttered off in all four directions, and finally settled on the forehead of the horse.

The horse neighed, snorted, and whinnied until he was able to kick up his hind legs. Then he reared to release the front legs and lunged forward. He galloped, kicked up high, and ran like prancing on air.

On earth, one of the holy people pointed to the soft ground and said, "The horse makes hoofprints like a butterfly."

11th Annual National Native American First Nations Cultural Curriculum Development Workshop, 1991.



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"HOW THE BUTTERFLIES CAME TO BE"

Long ago, Earth-Maker formed the earth. He then made Iitoi, our Elder Brother. It was spring.

Iitoi was walking around and saw some children playing. When he thought of how the children would grow old and die, he became very sad. He knew the flowers and trees would also fade. He knew the days would grow short and the nights would turn cold.

Suddenly, Elder Brother had an ideal He would create something to make children happy. He placed many things in a bag - brightly-colored flowers, fallen leaves, yellow pollen, white cornmeal, and green pine needles. Then he added some shining gold that he caught from the sunlight. He listened to the birds that were singing in the trees around him. He took some of their songs and placed them in the bag.

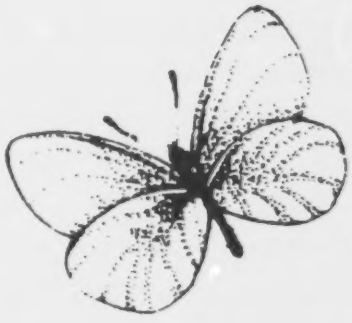
Then he called the children to gather round. He said, "I have something for you."

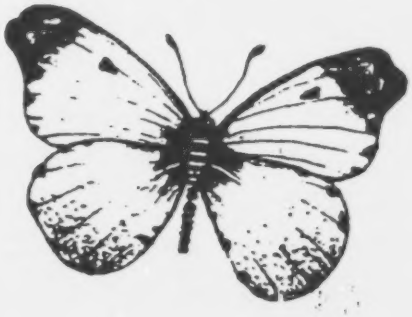
The little children opened the bag and butterflies flew out. Their wings were brightly colored. All the colors that Iitoi had put into the bag reflected in beautiful butterflies.

The children were happy as they watched the butterflies fluttering overhead. But as the butterflies were singing, the birds pleaded with Iitoi to give them back their songs. So Iitoi decided that the songs really did belong to the birds and not the butterflies.

From that day on, butterflies dance and flutter but they do not sing. They are silent.

Adapted from Keepers of the Earth, pp 83-94.





Science

Wildlife Food

Objective:

Students will learn the types of food animals eat in the forest.

Exploration:

Ask the students the following questions: When you need more groceries you go to the store and stock up. What do animals in the forest do? What do they eat? Where is it found?

The reference table may contain several books, including:

Hall, Bill. *A Year In The Forest.* New York: McGraw-Hill, 1973.

Kuhn, Dwight. *The Hidden Life Of The Forest.* New York: Crown Books, 1988.

Lerner, Carol. *On The Forest Edge.* New York: William Morrow and Co.. 1978.

Mabey, Richard. *Oak and Company.* New York: Greenwillow Books, 1983.

Lash, Herbert G. *A Walk In The Forest.* Montreal: Canadian Pulp and Paper Association, 1966.

Seminar:

Discuss: What do animals in the forest eat? Where is it found?

Invention:

The greatest variety of wildlife is found along the scrubby edges of forest growth. That's where the greatest variety of food plants grow. Some species of wildlife such as quail, pheasants and sharptail grouse prefer to feed near forest edges. These edges are found along the outside forest borders, beside roads, along stream banks and in farmstead shelterbelts.

Snowshoe and cottontail rabbits feed on bark and twigs of shrubs and small trees. Porcupines feed on bark of valuable forest trees, while beaver feed on the bark of less valuable aspen, willow and birch.

Bears, raccoons and many songbirds eat the berry-type fruits of wild plants such as strawberry, raspberry, blackberry, high-bush cranberry, blueberry, cherry and hawthorn. The ruffed grouse eats these berries as well as wild strawberry leaves, wintergreen and rose hips. During the winter, ruffed grouse eat buds and catkins of birch, hazel and aspen.

Deer prefer leaves, young twigs of northern white cedar, red osier dogwood and mountain maple. They also eat red maple, basswood, white pine, jack pine, willow and aspen. When

these plants are scarce during the winter months, deer will feed on spruce, tamarack, alder and hazel. They will starve if this is the only food available. Deer need forest plants. Their digestive systems are different from cattle; they would starve on a diet of hay.

Application:

Go on a nature walk. Look for typical feeding places of the animals discussed.

Invite the local Game Warden to participate in your nature walk. Game Wardens might be able to point out the feeding places of animals because they may be more familiar with the area.

SCIENCE --

"UNITY OF EARTH: BOTTLED BIO-COLUMN"

CULTURAL OUTCOME: II
SCIENCE OUTCOME: I

CULTURAL OBJECTIVE:

Students will understand that the Native American Sacred Pipe and Circle represent the unity of all things and the balance of the cycles that perpetuate life. They will be reminded of their power as active participants in nature, since no one part of the environment can be altered without affecting the others.

SCIENCE OBJECTIVES:

Students will:

know and practice the importance of conserving natural resources

explain the importance of natural cycles in the ecosystem.

TEACHER'S BACKGROUND INFORMATION:

The story, "The White Buffalo Calf Woman and the Sacred Pipe," helps demonstrate the interrelatedness of all things all Earth. The White Buffalo Calf Woman gives the people the sacred pipe. The parts of the pipe represent the animals, the plants, and the breath that carry their prayers to the Creator. She shows the people how to offer the Pipe to the Four Sacred directions, the Sky, and the Earth. This story teaches the people respect, and to live in ways that honor the interconnectedness of all things.

Follow the story with the discussion questions, taken from Keepers of the Earth(p.188).

STUDENT LEARNING ACTIVITIES

1. Write a story about human history and the ways in which people have treated the environment. Discuss ways to become better environmentalists.

2. Write a futuristic story of the relationship between people and Earth. Choose between:

   a. What will happen if we treat the Earth well?
   b. What will happen if we abuse the Earth?

3. Use "The Time of Our Lives" activity from KEEPERS OF THE EARTH (p. 189). The following is a summary of the activity:

   Using an open area, have the students walk a geologic time line. They will see the age of the earth and how short the age of humans has been. Discuss the impact humans have had on the environment in the short time they have been on the earth. Start with the time the solar system was born, 4.6 billion years ago to the present. Use the chart from KEEPERS OF THE EARTH (p. 190) to set up the time line.

4. Make a "Bottle Biome". The following materials are needed for each group of five students:

   four 2 - liter plastic bottles
   filament or duct tape
   pipe seal tape (white waterproof)
   two small corks or bottle stoppers
   drinking straws
   box (large enough to lay the bottle in lengthwise)
   utility knife

Aquarium Section

aquatic plant
gravel
aquatic insects
small goldfish

Fly Section

fruit flies

Plant Section

soil
1 - 2 small plants

Spider Section

Spiders
(Collected by an adult)

Bottle Cutting Instructions

a. Place all the bottles (individually) in the box and stabilize them. Using a felt tip marker, mark the bottle below the shoulder while rotating it around in the box. Repeat this above the hip on only 3 bottles.

b. Mark two small holes, as indicated in the diagram, to feed the flies and give the spider water.

c. Cut the holes with a utility knife. You may need to trim around each hole so that the cork fits into the hole snugly.

d. Using a utility knife, cut the bottles around the lines and save the tops.

5. Create Bio-Columns. Have the students observe how all the areas in the bio-column relate to each other over a period of time. They should pay attention to the spider's web-building, eating, and reproduction activities, as well as the growth of plants and the eating behavior of the fish.

a. Begin with the aquarium on the bottom. Set it up. Then replace the top with the pipe seal tape. DO NOT REMOVE THE CAP AT THIS TIME.

b. Place the second bottle on the top of the aquarium. Attach it with a 1 1/2" wide piece of filament tape that has been cut 15" long. Fill the bottle with dirt so that it is just below the top of the cap. Plant the plants. Then remove the cap from the first bottle. Replace the top of the second bottle and tape in place.

c. Place the third bottle on top of the plant section secure it in place with tape. Replace the top and secure with tape. Remove the cap and punch a hole in the cap large enough to put a 4" piece of a straw through it. Place the flies into the bottle then replace the cap.

d. Place the fourth bottle on top of the fly section. Secure it with tape and put the spiders into the bottle. Secure the lid with tape.

e. Students can set up different sections, under the supervision of the teacher or classroom aide.

f. To feed the flies, drop a piece of peach into the fly section through the hole.

g. To give the spider water, use a medicine dropper and squirt water into the spider section through the hole.

EVALUATION:

Each activity contains its own built-in evaluation, such as observing and recording changes in the bio-column, analyzing human impact on the earth, and hypothesizing the future impact of man on the earth.

RESOURCES:

Bottle Biology Resource Network. Madison, Wisconsin: University of Wisconsin, 1990.

Caduto, Michael J. and Joseph Burchac. Keepers of the Earth: Native American Stories and Environmental Activities for Children. Golden, Colorado: Fulcrum, 1989, pp. 187-192.

DEVELOPED BY:

Diane Cleveland
Renata Griego
Elaine Hendricks

SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN CYCLE OF LIFE UNIT -

Standard – Understands that scientific inquiry works in particular ways
Benchmarks –
Understands the many forms scientific investigations can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up by evidence

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that written communication is an essential part of doing science
Understands that doing science involves many different kinds of work and many different kinds of people

Standard – Knows about the diversity and unity that characterize life
Benchmarks –
Knows that living things can be sorted into groups in many ways using various properties to decide which things belong to which group
Knows that plants and animals are alive and go through predictable life cycles, which include growth, development, reproduction and death

Standard – Understands the genetic basis for the transfer of biological characteristics from one generation to the next
Benchmarks –
Knows that animals take some features from one parent, other features from the other parent, and some from both, or that sometimes offspring inherit features that seem to be more like those of its grandparents than its parents

Standard – Understands how species depend on one another and on the environment for survival
Benchmarks –
Knows that all organisms, including invisible organisms like bacteria, need their environments, are influenced by environmental forces and also influence the environment to some extent
Knows that plants and animal species depend on each other to maintain life, e.g., many plants depend on animals for carrying their pollen to other plants or for dispersing their seeds

Standard – Understands the cycling of matter and flow of energy through the living environment
Benchmarks –
Knows that all animals' food can be traced back to plants
Knows that some source of "energy" is needed for any work to be done; for example, food is the fuel and the building material for all organisms

Standard – Understands the basic concepts of the evolution of species
Benchmarks –
Knows that living things of the same kind vary among individuals, and sometimes the differences give individuals an important advantage in surviving and reproduction
Knows that cultivated plants and domestic animals result from selective breeding for particular traits
Knows that fossils provide evidence that some organisms living long ago are now extinct and can be compared to one another and to living organisms according to their similarities and differences

Standard – Knows the characteristics that distinguish the human species from other organisms
Benchmarks –
Knows that people have biologically determined reproductive functions and knows that in other species (e.g., insects) functions like defense or food collection may also be biologically determined

Standard – Understands the main steps in the transformation of a single fertilized cell into a fully-formed animal, and the process of the development and aging that follows birth
Benchmarks –
Knows that it takes about nine months for a human embryo to develop, receiving nourishment from the mother's body; substances the mother takes in affect – for better or worse – how well the baby develops
Knows that as people get older, they change in what they look like and what they can do
Knows that humans may live longer than most other animals, but all living things die
Knows that people may be physically able to have children before they know how to take care of them

Standard – Understands the conditions necessary for maintaining good physical health and why they are necessary
Benchmarks –
Knows that food provides "energy" and essential materials, like vitamins and minerals, for growth and repair of body parts
Knows that tobacco, alcohol, other drugs, and certain "poisons" in the environment (pesticides, lead) can do hard to people and other living things
Knows that taking care of our bodies – through proper diet, rest, exercise, and medical care – can help us grow up healthy

AMERICAN INDIAN CONTENT STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN CYCLE OF LIFE UNIT –

Science as Inquiry –
Indian students should develop an awareness that observations and understandings of nature and ecological relationships traditionally formed an essential base of knowledge among American Indian cultures.

Life Science –
Indian students should develop an understanding of immune system factors which led to the devastating effects of European-based diseases on American Indians.
Indian students should develop an understanding of the ecosystems knowledge evident in the American Indian agricultural practices of companion planting and fertilization.
Indian students should develop an understanding of concepts of nature's diversity, codependency and the intricate balance between natural forces and how they are reflected in traditional Indian philosophies and symbols, such as the Medicine Wheel.

Earth and Space Science –
Indian students should develop an understanding of the regular and predictable motion of the sun and moon and the places and ways in which American Indians observed them and how they employed their observations, e.g. in the agricultural and ceremonial cycles.

Science in Personal and Social Perspectives –
Indian students should develop an understanding of elements of pre-contact North American environment and how changes to them were brought on by the arrival of Europeans in North America, such as the effects of the fur trade on animal populations and its subsequent effect on Indian life.

History and Nature of Science –
Indian students should develop an understanding of examples of Indian men and women who currently engage in the activities of science.

CARING FOR LAND AND ANIMALS

Teacher's/Parent's Background Information -

A main reason for incorporating cultural concepts into science instruction for American Indian students is because Indian people have always been "scientists." Native cultures are holistic and, hence, view nature as the interactive relationships among living beings. For native people(s), maintaining their relationship with nature was critical to survival, both physically and spiritually. Their knowledge preceded the advent of scientific inquiry as it is known in the modern world. Native peoples pursued knowledge of the physical world and natural phenomena before anyone bore the modern day title of "scientist." Contemporary scientists credit Indian people with being exemplary users of "multiple use conservation."

> Native Americans have often been called the First Environmentalists because of the traditional concern for all living things on Mother Earth. That many of their men and women have achieved highly developed skills and extensive, intimate knowledge about the movements of the heavenly bodies, the chemical qualities of plants, and the medicinal applications of animal and botanical matter, has long been known and acknowledged by a number of anthropologists.

Such intimate knowledge leads to another reason for blending science and cultural concepts. Many contributions to science have been made by native people as a result of their detailed knowledge regarding the habits, habitats, ecological communities, microdistributions, seasonal variations, and recent history of the plant and animal species.

By exploring native cultures through a holistic perspective and through the contributions of native people, American Indians can truly be presented as multi-dimensional human beings - as complex, specialized, and knowledgeable individuals and acknowledges Indians as serious students of the world in which they live.

> The impressive knowledge of the Native American peoples about a wide variety of natural phenomena is not... accidental, nor has its acquisition been haphazard. It is based on generations of systematic inquiry. It is the accumulation and transmittal of repeated observations, experiments, and conclusions. Some of the elements of the scientific method were inherent in their processes.
>
> -from *Science and Cultural Curricula,* Indian Education Act Resource Center I, ORBIS Associates, Washington, DC, 1986.

LITERATURE FOR CARING FOR LAND AND ANIMALS UNIT –

Passing of the Buffalo in Keepers of the Animals by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum Pub., 1997. **Kiowa**

The Return of the Buffaloes by Paul Goble, National Geographic Society, 1996. **Plains**

Remaking the Earth by Paul Goble. **Plains**

There Still Are Buffalo by Ann Nolan Clark, Ancient City Press, 1992. **Plains**

Buffalo Days by Diane Hoyt-Goldsmith, Holiday House, 1997. **Crow**

Thunder Bear and Ko: The Buffalo Nation and **Nambe Pueblo** by Susan Hazen-Hammond.

The Legend of the White Buffalo Woman by Paul Goble, National Geographic Society, 1998. **Lakota**

The White Buffalo Calf Woman and the Sacred Pipe in Keepers of the Earth by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum Pub., 1988. **Lakota**

A Legend from the Crazy Horse Clan by Moses Nelson Big Crow **(Indian Author)**, Tipi Press, 1996. **Lakota**

Hokshila and the Red Buffalo by Moses Nelson Big Brow **(Indian Author). Lakota**

Buffalo by Tiffany Midge **(Indian Author)**, Scholastic Books. Stories from **Seneca, Omaha, Ojibwa, Wichita, Apache, Kiowa**

Adopted by the Eagles by Paul Goble, Aladdin, 1994. **Plains**

Eagle Boy in Keepers of the Animals by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum Pub., 1997. **Zuni**

Eagle Feather, An Honour by Ferguson Plain **(Indian Author)**, Pemmican Pub. **Ojibway**

Hidatsa Eagle Trapping, Reprints in Anthropology, Vol. 13 by Gilbert Wilson, Reprinted 1978, J. &. L. Reprint Co.

Tonweya and the Eagles by Rosebud Yellow Robe **(Indian Author)**, Dial. **Lakota**

Gluscabi and the Wind Eagle in Keepers of the Earth by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum Pub., 1988. **Abenaki**

Eagle Boy by G. Hausman. **Navajo**

Brave Bear and the Ghosts, A **Sioux** Legend by Gloria Dominic, Troll.

The Horse and the Dog in **Hidatsa** Culture by Gilbert Wilson, J. &. L. Reprint Co. Vol 10.

The Spotted Horse by Henry Tall Bull **(Indian Author)**, Montana Council for Indian Education.

Blue Canyon Horse by Ann Nolan Clark, Viking, 1954. **Southwest**

The Girl Who Loved Wild Horses by Paul Goble. **Plains**

How Wild Horses Were Captured by Montana Council for Indian Education, Billings.

Gift of the Sacred Dog by Paul Goble. **Plains**

Bringer of the Mystery Dog by Ann Nolan Clark, **Lakota** Books.

Paul Goble Gallery includes The Girl Who Loved Wild Horses and the Gift of the Sacred Dog, Simon and Schuster, 1999. **Plains**

Turquoise Boy – A **Navajo** Legend by Terri Cohlene, Troll.

Doesn't Fall Off His Horse by Virginia Stroud **(Indian Author)**, Dial. **Kiowa**

Lone Bull's Horse Raid by Paul Goble. **Plains**

Out of the Saddle: Native American Horsemanship by G. Pony Boy **(Indian Author)**.

American Indians as Cowboys by Clifford E. Trafzer.

What's the Most Beautiful Thing You Know about Horses by Van Camp.

After Columbus: The Horse's Return to America by Herman Viola, 1994.

The Mud Pony by Caron Lee Cohen, Scholastic, 1988. **Pawnee**

The Horsecatcher by Mari Sandoz. **Cheyenne**

Alice Yazzie's Year by Ramona Maher, Coward, 1977. **Navajo**

When the **Navajo** Had Too Many Sheep by George Boyce, Indian Historian Press, 1974.

Navajo Life Series by Hildegard Thompson, Haskell Indian Nations University.

Little Herder in Autumn, Little Herder in Spring, Little Herder in Winter, Little Herder in Summer by Ann Nolan Clark, Haskell Indian Nations University Foundation.

Dragonfly's Tale by Kristina Rodanas, Clarion, 1992. **Zuni**

The Boy Who Made Dragonflies by Tony Hillerman, University of New Mexico Press, 1972. **Zuni**

The Indian Way, Learning to Communicate with Mother Earth by Gary McLain, John Muir Pub., 1990. **Choctaw**

The Land, Remember the Land and Stock and People in Between Sacred Mountains: **Navajo** Stories and Lessons from the Land, Rock Point Community School **(Indian Author)**, University of Arizona Press.

And Still the Turtle Watched by Sheila MacGill-Callahan.

Red Ribbons for Emma, New Mexico Energy Collective, New Seed Press, 1981. **Navajo**

The Talking Earth by Jean Craighead George, Harper Trophy, 1987.

A Natural Education, Native American Ideas and Thoughts by Stan Padilla, Book Publishing Co., 1994.

CHECK YOUR LIBRARY AND BOOKSTORES FOR OTHER BOOKS ON THIS TOPIC.

ACTIVITIES FOR CARING FOR LAND AND ANIMALS UNIT -

1. Provide introductory information on caring for land and animals from the teacher's background information.

2. Have the students read legends about buffalo, eagles, horses or sheep. Have the students respond and retell them if appropriate. If the legends are from the local tribe(s), have the students check the accuracy and authenticity of the legends or find local legends about these animals. Can they be told at this time?

3. Have the students read nonfiction about buffalo, eagles, horses or sheep. Have the students summarize and report their findings.

4. Have the students read fiction about buffalo, eagles, horses or sheep. Have the students respond and compare and contrast the stories.

5. Have students read about Indian beliefs regarding caring for land and animals.

6. Have the students study about endangered species and the eagle and buffalo, especially. Identify Indian people who work in science fields affecting animals.

7. Have the students learn about caring for horses and sheep or cattle and the land that sustains them. Have them give presentations about this with visuals.

8. Have a local rancher and/or caretaker of buffalo visit the classroom and explain the importance of caring for land and animals.

9. Have the students visit a local ranch and/or buffalo herd and report on their visit(s).

10. Have the students learn how much a horse, sheep, cow or buffalo weighs and how much it might cost to buy one. How did Indian people measure the height of their horses a long time ago?

11. Have the students learn about the costs of caring for livestock or buffalo.

12. Have the students figure how much is made by selling livestock.

13. Have the students learn that some animals, such as the buffalo, and the eagle are considered especially sacred to Indian people and do related art project.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University or through the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Review the science standards for this unit. They will suggest further math and science activities. Also utilize the activities in the *Keepers* books.

SCIENCE/MATH -

"Stewards of the Earth"

TEACHER BACKGROUND INFORMATION:

There is an ongoing controversy on the Navajo Reservation between the Navajo Forest Industries and residents of the area and Navajo (Dine) CARE members. The Dine CARE organization and residents expressed concerns over logging practices, future forests and the overlooking of the cultural values of the Navajo people. Although President Zah declared 12,427 acres for wildlife, watershed protection, herb gathering and sacred sites this controversy is far from resolved. There are always going to be conflicts of interest between respecting Mother Earth and the need for jobs and revenue for the tribe.

Native Americans of the Northwest have petitioned for five salmon species to be declared endangered species. The decision on this petition and its economic impact will not be considered. In Alaska, the Alaskan Natives have voiced concerns over oil drilling in wildlife preserves which will threaten animal and plant habitats.

Various other tribes through out the United States and Canada have voiced similar concerns over the depletion of wildlife and resources. The opposition of Native Americans to the destruction of animal and plant habitats, agricultural land, fishing waters and religious sites has gone unheeded by the federal government, tribal governments and industries.

STUDENT LEARNING ACTIVITIES:

1. Brainstorm factors, other than humans, affecting the increase and decrease in animal population.(i.e., migration, natural predator, dispersal, old age/death, accidents, climate, quality of food and water, available shelter, and severity of weather).

2. Illustrate and design a large habitat mural with different animals that can be found near your school/community.

3. Write to the appropriate Tribal or Federal agency/office about local environmental concerns that may be a threat to animal and plant habitats.

BEST COPY AVAILABLE

4. Divide students into predator and prey. Predator eliminates a prey. The prey then becomes a predator. If the predator has no more prey, it dies. The dead predators will a have certain place to be (encircled area). Compare the physical graph.

   Make conclusions. What is the relationship between predator and prey.

EVALUATIONS:

Students will complete 2 or more of the activities listed below.

- Class participation
- Record in learning
- Portfolio

Students will choose an endangered species of North America and research the animal or plant. Students will write a report which includes the name of the selected species, characteristics, survival habits, habitat, how it is being protected and illustrations.

Students will develop a class book on the Endangered Species.

MATERIALS:

References books on local and national endangered species, dictionaries, illustrations of endangered species, butcher paper, crayons, markers, pencils, addresses of agencies, envelopes, writing paper, learning logs, portfolio, construction paper, computer with printer, book binder

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SCIENCE/MATH -

"Endangered Species Act of 1973"

TEACHER BACKGROUND INFORMATION:

The Endangered Species Act of 1973 will be challenged in Congress for re-authorization. Congressman James Hansen of Utah proposes the Human Protection Act. This act will "prohibit listing a species as endangered if the potential economic costs to society outweigh the potential benefits". The Human Protection Act may have hidden dangers for future decisions made on survival of any species.

Some experts believe protecting endangered species is a losing battle. Only a few threatened animals receive attention like the spotted owl, bald eagle, and the timber wolf. Smaller species like the soil microbes and small insects, which form the basis for the food chain, are becoming extinct. Dr. Craig Johnson of US Fish and Wildlife Service cites 3 major problems with trying to save endangered species: ignorance, huge workload, and apathy among the public.

Under the new administration, Interior Secretary Bruce Babbitt wants to increase the protection of endangered species. Mr. Babbitt has reassured miners, ranchers, and timber industries there will be no new radical policy. He does believe all those who profit from the natural resources should pay their share of revenue. The former Interior Departments have all ignored the exploitation of resources. Babbitt also wants to reinterpret the Endangered Species Act of 1973. Instead of concentrating on one species at a time, he proposes that we examine all species in a ecosystem as a whole.

STUDENT LEARNING ACTIVITIES:

1. Introduce the concept of Endangered Species. To find out how much students how about endangered species, have a students brainstorm ideas and knowledge. As a class web their ideas into various categories on large butcher paper.

BEST COPY AVAILABLE

2. Introduce vocabulary words. Discuss and define each word. Students can write their the words and definitions in their personal dictionary or work bank to used later in their writing activities.

prejudice	endangered	extinct	ecosystem
habitats	mother earth	universe	consumers
producers	survival	encroachment	avaricious
preserve	environment	species	poachers
rain forest	deforestation	conservation	depletion
impact	biome	erosion	pin cushion
barrel cactus	snow drops	saguaro	yew tree
octillio			

3. Divide class into groups of 5-6 students. Each group will plan and write a skit using the vocabulary words. Video tape the skits as the students perform the skit.

4. Present pictures of endangered species and list ways humans have help each specie and list ways humans have hindered each species.

5. Develop a transect on ant population in a small area. Take a 1-2 meter string and tie ends so that the student can enclose a section of the ground. Count ants in the area. Find area of the encloses section. Use proportionate figures to estimate the ant population visible of the playground.

EVALUATIONS:

Students may complete 2 or more of the activities listed below.

Students develop a post webbing activity and compare to the pre-webbing activity.

Students participate in class and group activities.

Students insert "What I have learned today.", comments, questions appropriate to lesson in their learning log.

Students maintain portfolio with notes, drawings, completed assignments, assessments.

Students create crossword puzzle using the vocabulary list.

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RESOURCES:

1. Allman, William F. and Schrof, Joannie M.. "Can They Be Saved?", U.S. News & World Report, October 2, 1989: p. 52.

2. Bjerklie, David. "Endangered Species Act and its Discontents". Technology Review, May/June 1992: p. 19.

3. Caduto, Micheal J. & Bruchac, Joseph. Keepers of the Animals. Fulcrum Publishing, Golden, Co. 1991: pp. 223-243.

4. Cohn, Jeffery P.. "Decisions at the Zoo", Bio Science Vol. 42 No. 9, October 1992: pp. 654-659.

5. Corn, M. Lynne. "The Endangered Species Act; the storm's eye". Washington Watch, October 1990: p. 627.

6. Davis, Phillip A.. "Upstream Battle for Survival Draws Support Salmon". Environment, March 9, 1991: pp. 602-603.

7. Down, Ann Hudson, "The Gifts of the Tree", MASINAIGAN, Winter 1993: p. 22.

8. Kaplan, Kim J. "Bring 'Em Back Alive and Growing", Agriculture Research, July 1991: pp. 4-12.

9. McDowell, Jeanne & Seldeman, David. "The Landlord", TIME, March 8, 1993: p. 38.

10. Valerie, Taliman, "Logging Issue Hits Compromise State", Navajo Times Vol. XXXII, August 13, 1992: pp. 1-A8.

11 "Protecting Endangered Species Look Like a Losing Battle", MASINAIGAN, Winter 1993: p. 1.

Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experience of my people. Teach your children what we have taught our children, that the Earth is our mother. The rivers are our brothers, they quench our thirst and feed our children. The air is precious to the red man, for all things share the same breath-- the beast, the tree, the man, they all share the same breath. And what is man without the beasts? If all the beasts were gone, men would die from a great loneliness of spirit.

This we know. The Earth does not belong to man; man belongs to the Earth. Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself. All things are connected like the blood which unites one family. All things are connected.

Sealth (Chief Seattle)

Science

Rotten Apples

Objectives:

Students will recognize that matter decomposes at different rates when placed in different mediums.

Students will demonstrate an awareness of how organic matter is decomposed by responding to questions and by observing apples decompose over time.

Materials:

- 3 apples (6 apples, if you want to run a parallel experiment omitting light)
- enough soil to bury one apple (You'll need a burying container for this if it is not done outside.)
- jar to hold enough water to float one apple
- a stick to spear one apple

Exploration:

1. Have students bury one apple in soil.
2. Have another group float one apple in a jar of water.
3. Have another group place an impaled apple in a shady grassy spot.
4. Run the same procedures, except place apples in dark places. (optional)

> **Teaching Tip**: To contain any fruit flies that might be interested in the experiment, make a mixture of apple juice, sugar, a few drops of liquid soap, and a little vinegar. Place the mixture in a pie plate near the experiment.

Seminar:

Have students discuss and record observations in their science journals. The science journal should contain sketches as well as written descriptions of what is happening.

Students should note: Which apple had a break in the skin first, any signs of organisms eating on the apple, any odors, the appearance of worms or other insects, the growth of fungi or mold, how many days it took to completely break down the apples, and they should note what seemed to be causing the decomposition.

Invention:

1. Students may be reminded of the First Law of Thermodynamics: Like energy, matter can neither be created or destroyed; it just changes form.

2. The students may discuss the decomposition processes observed, the changing nature of the apples, and relate this to the changing forms of matter.

   At this point vocabulary may be introduced.

3. Lead the discussion to recognize the **photodegradation process** (the sun's ultraviolet rays breaking the chemical bonds holding the matter together). After repeated exposures, the photodegradable matter breaks down into smaller and smaller units.

   photodegradable: material that can be decomposed when exposed to ultraviolet light from the sun.

4. Talk about the **biodegradation processes** (how microscopic bacteria and fungi break the chemical bonds in a material). These tiny organisms are varied and specialized. Some thrive early in the rotting process, while others come along at the end to finish the job. The activity of these organisms release many gasses, heat, water, and nutrients.

   biodegradable: material that can be decomposed by organisms like bacteria and fungi

5. Tie the processes together in discussing the decomposition of the apples.

Application:

Have students compare the methods and processes of waste decomposition. How can they use this information? Has it increased their awareness of the importance of finding ecologically sound solutions to the garbage problem, not only for people, but for all life forms?

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Science

Disposable Diaper Dissection

Disposable diapers are designed of new materials and are a primary recycling concern.

Objectives:

Students will identify the functions and materials in the disposable diaper.

Students will learn why the disposable diaper is not easily recycled.

Materials:

- clean, unused disposable diaper
  (Obtain a biodegradable variety, if possible.)
- paper cup half full of water
- magnifying glass (optional)

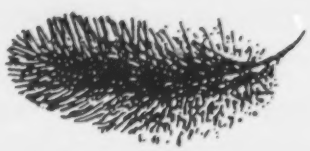
Exploration and Seminar:

Look closely at the whole disposable diaper. Carefully pull it apart and list all the different materials that you find on both the inside and outside of the diaper.

List at least six key functions that a disposable diaper might be designed to accommodate. Think about the effect of one of the parts of the diaper. Would the diaper work just as well without that part? For example, what if you removed the elastic part? Repeat this thought process for other parts of the diaper.

Suggested Questions:

Are there any materials that are not needed in order for the diaper to work?
Are there any diaper functions that are not provided for by the use of one or more of the materials?
Pour water onto the inside, soft part of the diaper. Carefully pull apart the fibers and see what happens to the water. Where did it go?
Is there a "hidden" material that you couldn't see in the earlier dissection?
What is the new material's job?
Go back to the dissected diaper and try to find the hidden material.



Invention:

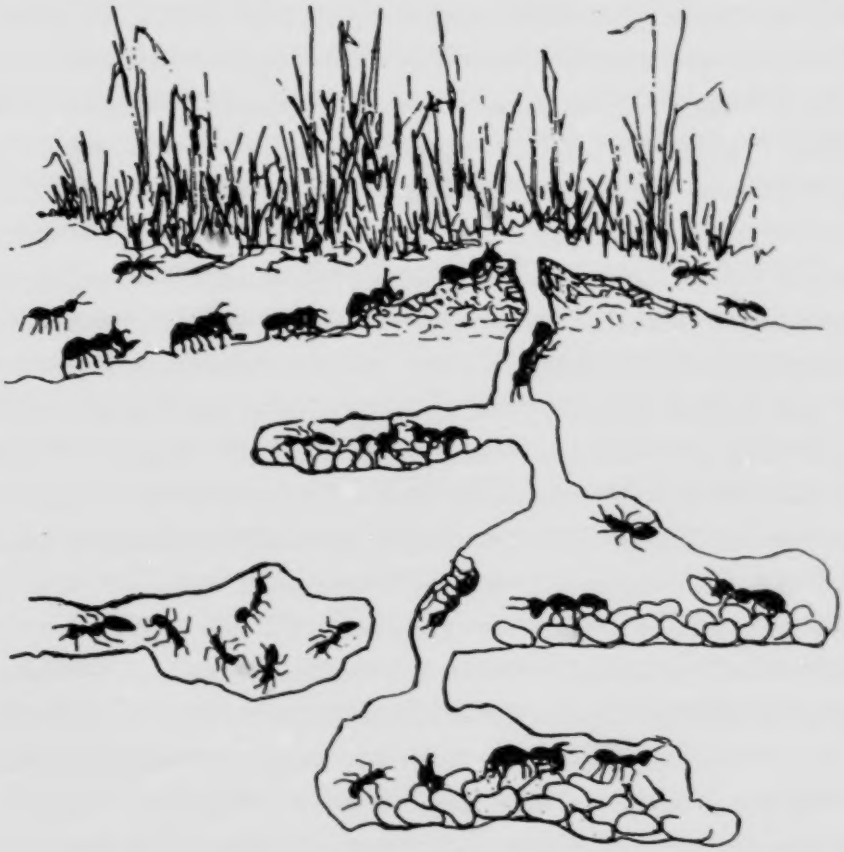
We have discussed what and why it is necessary for us to recycle. We must reuse as many of our resources as possible. After we have finished with the diaper dissection, separate the various materials into "recyclable" and "non-recyclable." You should have material in both categories.

Because disposable diapers are so bulky and can't easily be recycled once they have been used, they end up filling as much as 1% of our landfill space. Reusable cloth diapers made from cotton can be washed at home or sent to a diaper cleaning service. They do not end up in a landfill. When the cotton diapers are not used for their original intent, they make excellent dust cloths and ordinary rags.

Discuss with your class the pros and cons of cloth versus disposable diapers.

Application:

Can you think of a good way to redesign the disposable diaper so that it still does its "job" but doesn't cause such a problem for our environment? Share these ideas with your classmates.



Social Studies

What a Waste!–Part III

This lesson follows the landfill activity.

Objectives:

Students will imagine possible lifestyles of the garbage producers.

Students will develop a sense of using the three R's (**reuse, recycle, reduce**) in waste management.

Materials:

- rubber gloves (for each student)
- bags of trash
- chart for each group.

Chart: Draw 4 garbage cans and label: **paper, metal, plastic, glass**. Beside each garbage can have a series of lines for students to list items that could be placed in the cans. At the bottom have a space for the group to make some general deductions about the people based on observations from going through their trash.

Exploration:

Have students put on the rubber gloves. Give each group a bag of trash and a chart. Have them sort through the items, placing things in categories according to the label on the garbage cans.

Seminar:

Have students discuss their findings, and make deductions about the lifestyles (what people eat, use, and so forth) of the garbage producers.

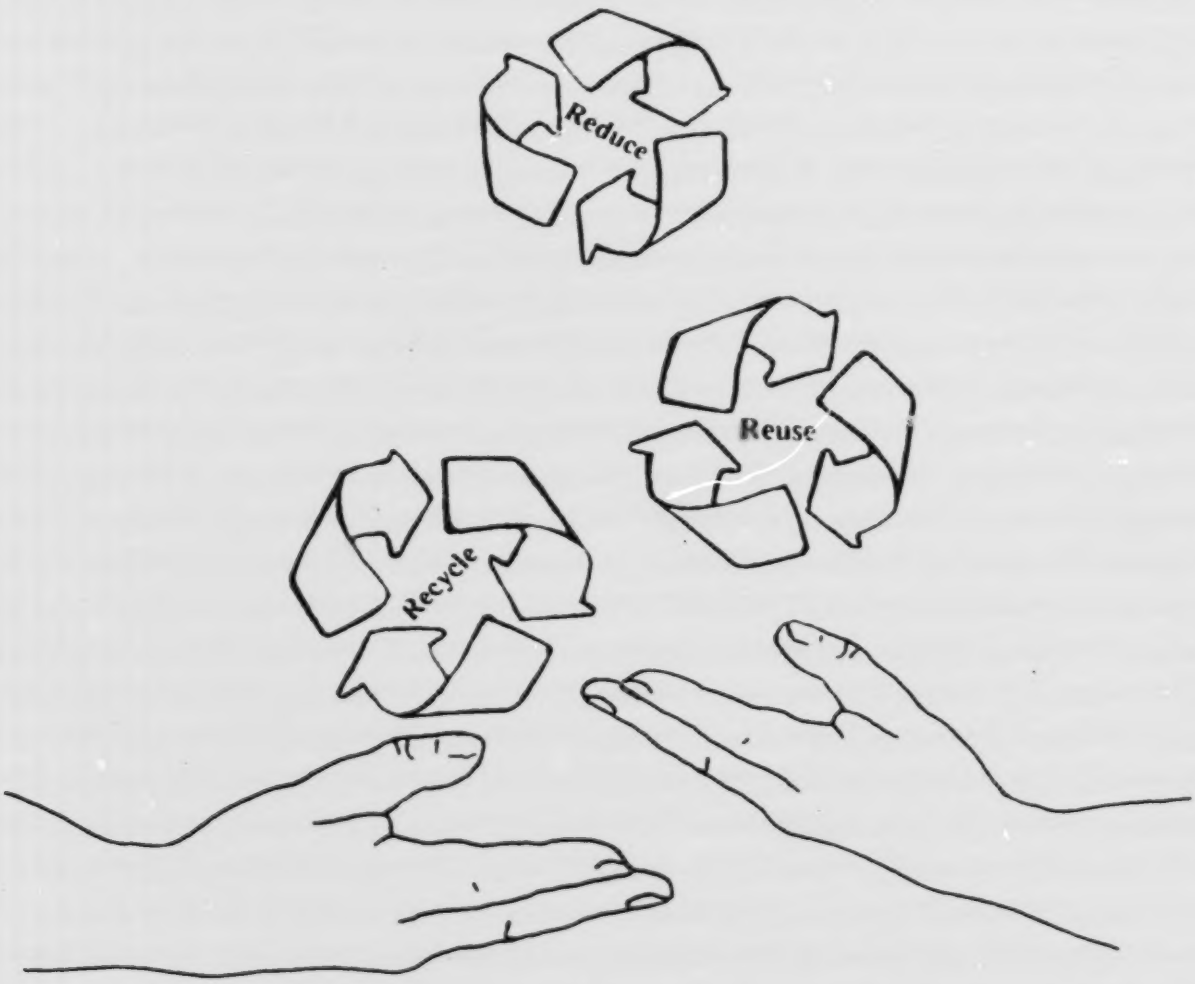
Invention:

Discuss the three R's of conservation for garbage: **reuse, recycle, reduce**. Could landfill life spans be increased by responsible handling of garbage? Discuss how anthropologists use garbage to study and make deductions about cultures.

Application:

1. Have students count the number of garbage bags their families use in one week, then use conscientious garbage management for a week and compare. Is there a reduction in the number of bags?

2. Have students brainstorm methods of dealing with the garbage problem. Have them develop a slogan for the "Three R's of Waste Management." Make a poster for their homes or school.



SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN CARING FOR LAND AND ANIMALS UNIT -

Standard – Understands that scientific inquiry works in particular ways
Benchmarks -
Understands the many forms scientific investigations can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up by evidence

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that doing science involves many different kinds of work and many different kinds of people
Understands that written communication is an essential part of doing science

Standard – Understands the processes that shape the surface of the earth and the relation of the surface of the earth to the living environment
Benchmarks –
Knows that waves, wind, water, and ice change the earth's surface to produce many of the landforms, such as shorelines, cliffs, deserts, and valleys (wind and water can move soil).
Knows that some geologic changes happen slowly, others rapidly; the earth's surface is shaped in part by the motion of water and wind

Standard – Knows about the diversity and unity that characterize life
Benchmarks –
Knows that living things can be sorted into groups in many ways using various properties to decide which things belong to which group
Knows that plants and animals are alive and go through predictable life cycles, which include growth, development, reproduction and death

Standard – Knows the general structure and functions of cells in organisms
Benchmarks –
Knows that plants and animals need air, food and water

Standard – Understands how species depend on one another and on the environment for survival
Benchmarks –
Knows that all organisms, including invisible organisms like bacteria, need their environments, are influenced by environmental forces and also influence the environment to some extent

Knows that plants and animal species depend on each other to maintain life, e.g., many plants depend on animals for carrying their pollen to other plants or for dispersing their seeds

Standard – Understands the cycling of matter and flow of energy through the living environment

Knows that all animals' food can be traced back to plants

Knows that some source of "energy" is needed for any work to be done; for example, food is the fuel and the building material for all organisms

Standard – Understands the basic concepts of the evolution of species

Benchmarks –

Knows that living things of the same kind vary among individuals, and sometimes the differences give individuals an important advantage in surviving and reproduction

Knows that fossils provide evidence that some organisms living long ago are not extinct and can be compared to one another and to living organisms according to their similarities and differences

AMERICAN INDIAN CONTENT STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN CARING FOR LAND AND ANIMALS UNIT –

Science as Inquiry –
Indian students should develop an awareness that observations and understandings of nature and ecological relationships traditionally formed an essential base of knowledge among American Indian cultures.

Physical Science –
Indian students should develop an understanding of the principle of changes of properties in materials applied in the daily activities of early Indians such as evidenced in the production of glue from the hooves of a deer.

Life Science –
Indian students should develop an understanding of the ecosystems knowledge evident in the American Indian agricultural practices of companion planting and fertilization.
Indian students should develop an understanding of concepts of nature's diversity, codependency and the intricate balance between natural forces and how they are reflected in traditional Indian philosophies and symbols, such as the Medicine Wheel.

Science and Technology –
Indian students should develop an understanding of the technological design process and how it was applied in the development of various tools and technologies employed by early American Indians.

Science in Personal and Social Perspectives –
Indian students should develop an understanding of elements of pre-contact North American environment and how changes to them were brought on by the arrival of Europeans in North America, such as the effects of the fur trade on animal populations and its subsequent effect on Indian life.
Indian students should develop an understanding of how environmental degradation may be occurring in their communities and/or on reservation lands.

History and Nature of Science -
Indian students should develop an understanding of examples of Indian men and women who currently engage in the activities of science.

INDIAN ART

Teacher's/Parent's Background Information -

There are artists in every Indian tribe. This has always been the way. Probably every tribe had something only they made – a special way of showing their artistic talent. But most tribes shared much of the art styles with neighbors. Because of this, the art of Indian people can be grouped into culture areas. Indian people used things in their natural environments to make art objects. That's one reason art is not the same in one place as it is in another.

Indian people in each culture area have found many ways to express their love of beauty and their creative talents. Artists from many tribes still do traditional things. Here are just a few examples of tribal art from each culture area. See if you can tell why these tribal groups used certain things for their artwork because of where they live.

ARCTIC people carve on stone, bone, horn and ivory. Most art is used to decorate everyday tools, such as a knife handle or a harpoon head.

NORTHWEST COAST people are known for their carvings on totem poles, house fronts, canoes, and wooden boxes. These carvings are figures of animals, monsters, and human beings. Some of these carvings are painted, mostly in the colors red and black.

PLAINS tribal people painted their artwork on buffalo hides because, as hunters, hides were available to them. These hides were painted and decorated with porcupine quills. In some tribes symbols were painted on the outside of tipis. Colors most often used in painting were brown, red, yellow, black, blue and green. These are the colors of nature.

PLATEAU tribes painted and decorated their tipis, parfleche cases and shields. Clothing was decorated with porcupine quills, shells, elk teeth, feathers, and bear claws. They also wove cornhusk bags and other types of baskets.

SOUTHWEST people create their artwork on pottery, baskets, woven cloth, jewelry and in sand paintings. Designs often use shapes, but pictures of birds, animals, and human beings are used, too.

SOUTHEAST people used their own bodies on which they painted beautiful and detailed designs. The most common colors were red, black, yellow, white and blue. People's clothing was also richly decorated with shells and feathers.

NORTHEAST people were artists who painted on bark, something that was easily found in the forests where they lived. They also made beautiful wood carvings. Clothing and bark baskets were decorated with porcupine quills. Some artists carved pipes from stone. Over the years, these culture groups borrowed from each other and developed new forms of art. Indian artists are still at work making things that tell us about their traditions. Some Indian artists are borrowing from the art of the past or other tribal groups to create something brand new. These new art styles help us understand what Indian cultures are like today.

The oldest kind of Indian art was made thousands of years ago. It is known as "rock art." There are different kinds of rock art. The most common are PETROGLYPHS which are carvings made on the surface of rocks. Another kind is called PICTOGRAPHS. These are rock paintings. Some Indian people also carved whole figures out of rock, SCULPTURES. Some of these sculptures were tools that were for everyday use, like grinding stones, bowls, and hammers. Some were art objects of religious importance. Other stone art was carried by special people to show they were leaders of the tribe.

The figures carved or painted on rocks shows animals, people, monsters, or shapes, like circles and squares. Some of these were put there to tell a story. Others were for religious purposes. Some were probably meant to entertain or be funny, like a comic strip in a newspaper. Because rock does not rot away like wood does, much of the Indian rock art has lasted many thousands of years. People can see them even today. This rock art gives us a chance to enjoy the work of Indian artists who lived long ago.

from *Indian Culture Units on American Indians: Visual Arts,*
ORBIS Associates, Washington, DC, 1987.

Reference: *Introduction – Indian Art*, Airport School District, Michigan.

LITERATURE FOR INDIAN ART UNIT –

Forbidden Talent by Redwing Nez (**Indian Author**), Northland Pub., 1995. **Navajo**

The Ledgerbook of Thomas Blue Eagle by Gary Matthaei. **Lakota**

This Land Is My Land by George Littlefield (**Indian Author and Artist**).

Native Artists of North America by Reavis Moore.

Patrick Desjarlait: Conversations with a Native American Artist by Patrick Desjarlait (**Indian Author and Artist**), Runestone Press. **Ojibwa**

Oscar Howe by John R. Milton, Dillon, 1972. **Lakota**

Michael Naranjo by Mary C. Nelson, Dillon, 1975. **Pueblo**

George Morrison, **Chippewa** Artist, Dillon.

Pablita Velarde by Mary C. Nelson, Dillon, 1972. **Pueblo**

Maria Martinez by Mary C. Nelson, Dillon, 1972. **Pueblo**

Daisy Hooee Nampeyo by Carol Fowler, Dillon, 1977. **Pueblo**

Contemporary American Indian Artists by Dawn Reno.

R. C. Gorman-**Navajo** Artist, Available from Four Winds Books, York, NE.

Tending the Fire, The Story of Maria Martinez by Juddi Morris. **Pueblo**

Where There Is No Name for Art by Bruce Hucko. **Pueblo**

Navajo Visions and Voices Across the Mesa by Shonto Begay (**Indian Author**), Schol.

Rainbow at Night by Bruce Hucko. **Navajo**

The Porcupine's Quills in Skunny Wundy by Arthur Parker, Albert Whitman, 1970.

The Pine Ridge Porcupine by Ann Nolan Clark, **Lakota** Books.

Quillworker: A **Cheyenne** Legend by Terri Cohlene, Troll. 1990.

American Indian Beadwork by W. Ben Hunt.

Indian Designs by David Villasenor.

Sea and Cedar by Lois McConkey, Firefly, 1973. **Northwest**

The Button Blanket, a **Northwest** Coast Activity Book.

Bentwood Box Activity Book, A **Northwest** Coast Activity Book.

How to Make a Native American Dance Shawl. Video

Shannon, an **Ojibway** Dancer by Sandra King **(Indian Author)**, Lerner.

Morning Arrow by Nanabah Chee Dodge **(Indian Author)**, Lothrop, 1975. **Navajo**

Colors of the **Navajo** by Emily Abbink, Carolrhoda, 1998.

Songs from the Loom – A **Navajo** Girl Learns to Weave by Monty Roessel **(Indian Author)**, Lerner. We Are Still Here Series.

Lucy Learns to Weave by Virginia Hoffman, Woodside & Co., **Navajo** Curriculum Center Press.

Weaving a **Navajo** Rug by Begay Students, Chinle, AZ.

The Magic of Spider Woman by Lois Duncan, Scholastic, 1996. **Navajo**

Shota and the Star Quilt by Margaret Bateson-Hill, Consultant Gloria Runs Close to Lodge, **Lakota** text by Philomine Lakota **(Indian Author)**, Zero to Ten Ltd., 1998.

Morning Star Quilts by Florence Pulford.

Star Quilt Sticker Book, Little Dover Books. **Plains**

The Star Quilt, a Symbol of **Lakota** Identity by Marla N. Powers, Lakota Books, 1990.

Simply **Seminole**: Techniques and Designs in Quiltmaking by Dorothy Hanisko.

Weaving, a **California** Tradition by Linda Yamane **(Indian Author)**, Lerner. We Are Still Here Series. Basket Making

Nesuya's Basket by Carol Purdy, Montana Council for Indian Education. **Maidu**

Waw Giwulk: Center of the Basket, **O'odham**, and The First Basket, **Mandan**, in Keepers of Life by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum, 1998.

When Clay Sings by Byrd Baylor, Scribner's, 1972. **Pueblo**

A First Clay Gathering by N. Naranjo- Mores, 1994. **Pueblo**

Children of Clay – A Family of **Pueblo** Potters by Rina Swentzell **(Indian Author)**, Lerner. We Are Still Here Series.

Helen Cordero and the Storytellers of **Cochiti Pueblo** by Nancy Shroyer Howard, Davis Pub., 1995.

Before You Came This Way by Byrd Baylor, Dutton, 1969. Rock Art

Stories on Stone: Rock Art, Images from the Ancient Ones by Jennifer Dewey, 1996.

Picture Writing of the American Indian by Garrick Mallery.

Native American Rock Art: Messages from the Past by Yvette LaPierre, 1994.

The Same Sun Was in the Sky by Denise Webb, Northland, 1994.

Grandmother's Dreamcatcher by Becky McCain, Albert Whitman, 1998.

There are many Indian art books for adults that contain pictures of art items.

CHECK YOUR LIBRARY OR BOOKSTORES FOR OTHER BOOKS RELATING TO THE TOPIC.

ACTIVITIES FOR INDIAN ART UNIT –

1. Provide introductory information about Indian art to the students from the teacher's background information.

2. Have the students read nonfiction selections about Indian art and summarize and report their findings. Discuss their accuracy if about art of the local tribe(s).

3. Have the students read biographies about Indian artists and report.

4. Discuss Indian art in the past, rock painting, decorations on clothing, etc.

5. Discuss the science necessary for early Indian art items.

6. Discuss Indian art of the present: painting, sculpting, basketry, etc.

7. View pictures and samples of Indian art in the classroom.

8. Visit local museums or crafts shops to view Indian art items.

9. Learn what Indian art items were prominent in the local tribe(s).

10. Research and find local Indian artists.

11. Have local artist(s) give presentation(s) to the class. Have the students write the invitations and thank you letters.

12. Have students do Indian art projects. Figure the cost of various projects.

13. Have students report the science necessary in various Indian art projects.

14. Use art projects to reinforce the use of aspects of the Native language.

15. Have students sell some art projects or have an art auction.

16. Discuss how Indian art has contributed to the economy of Indian people.

17. Have students give presentations on what they have learned with visuals.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University or through the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

MATH AND SCIENCE --

"BEAUTY FROM THE EARTH: NAVAJO NATIVE DYES"

CULTURAL OUTCOMES:	**VI, VII**
MATH OUTCOMES:	**IV, VI**
SCIENCE OUTCOME:	**II**

CULTURAL OBJECTIVES:

Students will understand that:

weaving is an important art within the Navajo tribe

Native Americans make use of local plants and minerals in producing the dyes for the wool.

MATH OBJECTIVES:

Students will:

measure the length and weight of objects by using metric and standard units of measure

identify shapes and figures by name

recognize elements of similarity, congruence, and symmetry of simple concrete objects or models

identify line segments, intersecting lines, and parallel lines.

SCIENCE OBJECTIVES:

Students will:

gather information

understand and apply information and concepts

understand the cause and effect relationships.

TEACHER'S BACKGROUND INFORMATION:

In the Navajo legend about Spider Woman from Our Friends the Navajos (p.10), Spider Woman teaches the First Woman how to weave on a loom that Spider Man had explained how to build. After reading this legend to the class, discuss its importance and meaning. Refer to the legend "The First Spinner" adapted from Waterless Mountain, (p.33-35):

Spider Woman teaches the First Woman the art of dyeing. The old women who weave in this story believe that Spider Woman must be remembered, and tribute paid to her, for teaching The People how to weave. It is said that if one does not give her credit for her knowledge, Spider Woman will spin webs in the head of the weaver, who will lose much of her knowledge, intelligence, and wisdom. One of the ways to pay tribute to Spider Woman is to leave a small hole or "Spider Hole" in the weaving.

Many people believe that the Navajo learned the art of weaving from the Pueblos. If this is true, then they have excelled much further in the art than their masters have to date. The Navajos have been the least influenced by the Europeans and have created an art unmatched by any other tribe.

Most Navajos use wool from their domestic sheep. The wool is washed after it is sheared. They "card" the wool (combing it with hand cards). To spin the wool, they use a tool called a spindle which is a slender stick inserted through the center of a round wooden disc.

Navajos use native plant dyes to color wool. These native plant dyes are made by using plants and minerals easily found in their native land. The colors that can be produced by these plants and minerals range over many shades of yellow, black, brown, rose, tan, gray, pink, and orange. A good shade of green was not attainable through natural materials.

In preparing plant dyes there are no exact measurements used, just approximate ones. Cactus fruit, plants, and bark are measured in pans, Sumac and Navajo Tea are made in rolls, and rugs are measured in hand-lengths.

The colors and shades produced by plants vary depending upon local soil conditions, weather and the seasons. Alum is added in some preparations when dyeing the wool to help intensify the color. This mineral (an aluminum salt) is found in the form of soft white chunks and is collected from under rocks in flat areas where there has been recent water evaporation. Alum forms crystals like table salt and is also used in industry for making cosmetics, dyes, in baking powders, crunchy pickles and leather tanning agents.

STUDENT LEARNING ACTIVITIES:

1. Invite a grandmother with weaving experience to come to the class and talk to the students about the dyeing and weaving processes. Invite an elder or special visitor to show several plants that can be found in the area. This information will be important for a field trip. Have the person explain when the plants are available for collecting.

2. Take the class on a field trip near the school and divide them into groups. This is necessary since you will need to collect plants and minerals for the Dyeing Activity. Explain to the students how much of each item is required and have them approximate that amount when the item is in a paper sack. Remembr to use smaller quantities of fresh plants than dried plants to produce a given color.

3. Spin wool with a spindle and roll into large loops so it can be put into the dyes. This wool will be used later when the students create their own weaving on the loom.

4. Prepare dyes from the plants listed on the chart at the end of this lesson and throw the chunks of alum on hot coals or a pan until they start to foam; then drop into the dye bath.

5. Have the students design a simple pattern, either with the bead frame or on paper. Copy the design so that the students can try different color patterns to see which one they like the best.

6. Make a simple loom and use the yarns dyed in class to create a weaving. Allow at least one hour to do the weaving. If the students are unable to finish during the project time, allow the students to work on it during free time, recess, and before and after school.

The following materials are needed for each student:

needle	kitchen fork
scissors	stiff cardboard (9" x 12")
ruler	warp string (wool spun or cotton string)
pencil	yarn (wool spun or store bought)
2 sticks or twigs	

a. Cut the piece of cardboard at each end with small slits about 1/4" apart and about 1/2" long. These slits will hold the warp in place.

b. Attach the yarn through to the cardboard with a knot around the first slit.

c. Pull the yarn across the loom to the opposite notch on the other side of the cardboard. Loop the yarn around the small tab and go through the next notch. Continue doing so until the loom has been threaded and tie off the yarn with a knot.

d. Begin weaving the pattern that the students designed during the previous lesson. Remind the students not to pull the yarn too tightly at the edges when they go back and forth. If they do, their weaving will pull in towards the center. Be sure that the students understand that each row of yarn must fit tightly with the one above it.

e. When it is necessary to change yarn, leave about 2" hanging on the edges so that students can weave them in later. This will be done after the weaving has been taken off the loom.

f. When the weaving has been completed, remove it from the loom. Bend down the tabs, carefully, one side at a time. Slide a stick or twig through the loops of the yarn at each end.

g. Display the weavings in the classroom. Have the students compare their design with the finished product.

7. Let the students use a bead frame for counting by 1's, 2's, 5's, etc. Have the students use them to figure out certain problems that you have distributed to the class or have put on the chalkboard.

(Adapted from Learning Mathematics - A Program for Classroom Teacher.

EVALUATION:

Each activity will have its own built in evaluation. These include identifying which plants are used for dyeing wool, observing the cause and effect relationship of the wool changing color in the dye bath, learning how to make a loom by following written directions, and creating a weaving that can be enjoyed by all.

MAKING NATURAL DYES

PRICKLY PEAR CACTUS -- COLOR # 9 -- ROSE

2 lbs. fresh prickly pear 1 lb. spun wool

Squeeze the juice from the fruit and strain into 3 gallons of cool water. Add wet spun wool. Let stand in a warm place to ferment for 1 week. Rub the dye into the spun wool often. Dry.

SCRUB OAK -- COLOR # 47 -- LIGHT GOLD

4 lbs. gall from the oak tree 1 lb. spun wool
1/4 cup raw alum

Pulverize the gall (an outgrowth on the bark) which is used for dyeing and boil in 5 gallons of water for 2 hours. Strain. Add the raw alum to the dye water and boil 10 minutes. Place the wet spun wool into the dye bath and stir well. Boil for 2 hours. Allow to remain in the dye bath overnight. Rinse. Dry.

SUMAC, PINON, AND OCHER -- COLOR # 69 -- BLUISH BLACK

2 lbs. sumac twigs w/leaves 3 cups yellow ocher
3 cups pinon pitch 1 lb. spun wool

Roll the sumac into rolls of leaves and stems (4 large rolls). Boil the sumac with 6 gallons of water for 1-3 hours. While the sumac is boiling, toast the ocher to cocoa brown in a frying pan. Drop in the pitch, a little at a time and stir well. It should be shiny like gun powder and have a bluish color. Cool the ocher until just warm before using. Strain the sumac, add the ocher and pitch, stir and boil 15 minutes. Add the wet spun wool. Boil 2-3 hours Leave the wool in the dye bath overnight. Rinse 2 or 3 times and dry. Shakes or rub in a cloth to remove loose powder.

NAVAJO TEA -- COLOR # 73 -- ORANGE

2 lbs. dried Navajo Tea 1 lb. spun wool
1/2 cup raw alum

Boil the Navajo Tea (leaves, stems, and flowers) in 5 gallons of water for 1 hour. Strain. Add alum. Let boil. Stir well. Add wet spun wool. Stir again. Boil 2 hours and remove immediately from the dye bath for this tone of color. Rinse well. Dry.

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WILD WALNUT HULLS -- COLOR # 80 -- RICH BROWN

2 lbs. wild walnut hulls 1 lb. spun wool
1/2 cup raw alum

Crush the hulls, add 4 gallons of water, and let soak overnight. Boil 1 hour and strain. Add alum and boil 10 minutes. Stir well. Add the wet spun yarn into the dye bath, stir, and let boil for 2 hours. Leave in dye bath overnight then rinse. Dry.

CLAW, OWL'S (HELENIUM HOOPESII)

g'asdah bee aah

CACTUS, PRICKLY PEAR
(OPUNTIA POLYCANTHA)

hwoshntxyeedi binesd'q'

BEEPLANT, ROCKY MOUNTAIN
(CLEOME SERRULATA)
waa'

MIXING NATURAL WOOL COLORS

You can mix the natural colored wool to create other colors. Use the following proportions:

GRAY	1/2 lb. natural black wool 3/4 lb. natural cream wool
BROWN	1/2 lb. natural brown wool 1/2 lb. natural tan wool
TAN	1/2 lb. natural brown wool 1/2 lb. natural cream wool

Mix wools together and card. Pull into pieces, mix again, and card again to get an even color.

WHITING WOOL

1/2 cup white clay(calcium carbonate)2 cups water
2 tbsp. ground toasted gypsum1 lb. spun wool

Dissolve the clay and the gypsum in the water and rinse the yarn in it. This will make a white not a cream yarn.

The white clay is found in arid regions throughout the Navajo reservation as a vein around table lands.

Gypsum is collected around coal mines. It has a crystalline appearance. It is toasted by throwing it into the fire or baking it in the oven until it turns white. It is ground into a fine powder before use. You will find many additional dye "recipes" in the book, Native Navajo Dyes.

BEST COPY AVAILABLE

RESOURCES:

Our Friends - The Navajos. Papers on Navajo Culture and Life. Tsaile, Arizona: Navajo Community College Press, 1976.

Armer, Laura (Adams). Waterless Mountain. New York: David McKay and Company, 1963.

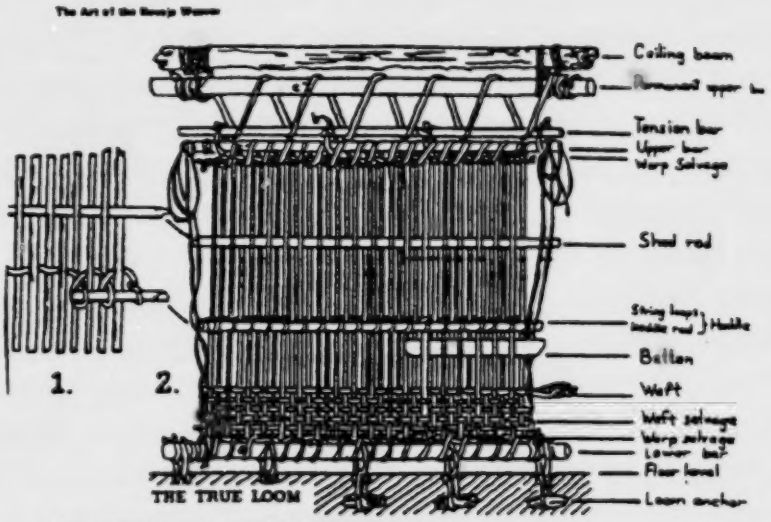
Mathews, Washington. Navajo Weavers. Palmer Lake, Colorado: Filter Press, 1968.

Navajo Native Dyes: Their Preparation and Use. Palmer Lake, Colorado: Filter Press, 1978.

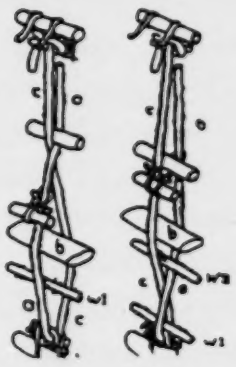
McKeown, Ross. Learning Mathematics A Program for the Classroom Teacher., Portsmouth, New Hampshire: Helnemann, 1990.

DEVELOPED BY:

Diane Cleveland
Renata Griego
Elaine Hendricks



The vertical loom, rigged for plain weave. (1) Detail showing the rigging of string loops to the heddle rod. (2) A diagram of the loom and its working parts. (3 and 4) Diagrams illustrating the functions of shed rod and heddle in changing sheds. Only two warps, c and o, are drawn in. These represent, respectively, the even-numbered and odd-numbered warps. The shed rod passes behind c--or behind all the even-numbered warps (2, 4, 6, 8, etc.) Heddle loops clasp o, or all odd-numbered warps. In diagram 3 the heddle is shown pulled forward, and the batten, b, inserted behind o and turned sideways to open the shed for the first weft, W1. In 4 the shed rod is shown forced down against the heddle loops, and the batten holding open the shed thus formed. The second weft, W2, is in position.



Loom drawings by
Frances R. Raynolds and Malcolm Withers

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MATH AND SCIENCE --

BASIC GEOMETRIC DESIGNS OF THE PLAINS INDIANS

CULTURAL OUTCOME:	**VII**
MATH OUTCOMES:	**IV, VI**
SCIENCE OUTCOME:	**II**

CULTURAL OBJECTIVES:

Students will understand and appreciate the importance of geometric designs used in many cultural aspects.

MATH OBJECTIVES:

Students will:

identify points, lines, intersecting lines.

find areas and perimeters of squares, rectangles, triangles, and quadrilaterals.

SCIENCE OBJECTIVES:

Students will:

gather information.

understand and apply information and concepts.

analyze, synthesize, and evaluate information.

TEACHER'S BACKGROUND INFORMATION:

In the early development of beadwork among the Plains and Woodland Indians, there were distinct geographic areas in which two types of decorative designs were used. Semi-conventionalized floral designs were used by the beadworkers in the region about the Great Lakes, and geometric forms were developed by those in the area of the Great Plains.

The final style of Sioux beadwork is a combination. It is distinguished, first of all, by an all-over, light-colored background on which appears three kinds of figures:

1. Early, simple forms, like blocks and crosses, taken from quillwork or pony beads.
2. Tall triangles and k shapes reminiscent of the parfleche.
3. Delicate designs like those of Caucasus rugs with forks, lines and terraces.

The Plains Indians have all used similar design elements and design units or motifs in their beadwork. The straight line or narrow band, usually the width of several beads, has been used in simple arrangements since the days of the early porcupine quillwork. The lines are continuous, parallel, or crossed, occurring alone or as an attachment to other design elements. Joined at angles of different degrees, the straight lines are used to form the box, the rectangle, the dragon fly, the three-pronged fork, the-full-points, and the horse tracks design units which form the basis of many of the Sioux design patterns.

Equilateral, isosceles, and right-angled triangles are all popular design motifs with the Sioux beadworkers. In the pony bead period the triangles were tall and slender. The triangles are used alone with an apex pointing upward or in a few combinations that are often repeated. Two right-angles triangles standing on the same line, their acute angles facing each other, form a motif of common occurrence in the southern part of the Plains. In beadwork the triangles are necessarily serrated or stepped.

With two isosceles triangles arranged base to base, a diamond or lozenge is formed. Sometimes the two triangles are given different coloring but more often are treated as a unit that becomes the center of an interesting design. A small rectangle, a pair of bars, or some other design is often enclosed within the diamond. Lines or triangles are almost always attached to two opposite corners of the diamond or to all four corners. Two right-angles triangles are quite generally used on the way. The trident form is used frequently in combination with two right-angle triangles and the diamond. Another much used motif in Sioux patterns is the "hour-glass" design where two equilateral triangles are joined at the apex.

STUDENT ACTIVITIES:

1. Students will identify and know the meanings of the words presented in this unit.

lines	rectangles	right-angle triangle
parallel	equilateral	apex
box	isosceles	acute angle
serrated	stepped	lozenge
trident form		

2. Students will be given copies of Sioux design elements and discuss what each design signifies, and how the designs were important to their ancestors.

3. Students will go to the library and find books on their culture and see how much material they can find and how much of their cultural history includes designs.

4. Students will be given simple Sioux designs to draw on their graph paper. After each student has finished they will discuss what geometric designs and shapes they have used.

5. Students will create and color their own designs using what they have learned.

EVALUATION:

Students will be evaluated by using a check list, to identify what geometric figures were used in their own drawing.

RESOURCES:

Lyford, Carrie A. (1984). Quill and Beadwork of the Western Sioux Golden, CO: Fulcrum Publishing.

American Indian Design and Decoration

DEVELOPED BY:

Joy Valandra
Colleen Weiss

Science

Ribbons of Color

Objectives:

Students will discover the colors of the spectrum.

Students will describe refraction of light.

Materials:

- a bright sunny day
- prisms
- glass of water
- white tagboard
- watercolors
- scissors
- string or thread
- disc pattern

Exploration:

1. Give each group of students a prism. Have the children describe what they see when the light passes through the prism. Ask: What colors do you see reflected on the ceiling (or wherever the light is reflected)?

2. Now give each group a glass filled with water. Tell them to hold it up to the sunlight. Ask: What do you see? How is this experiment similar to the first experiment? How is it different? How would you explain what's happening in these experiments? Give the students 10 minutes to report back.

3. Now hand out a mirror to each group and have the children reflect the sunlight on the ceiling. Give the students 10 minutes for group discussion. Ask: How is this experiment similar to the first experiment? the second experiment? How would you explain the differences?

Seminar:

Tell the students that some objects will refract, or bend, light such as the prism or water, that is why we see a rainbow after the rain. A mirror reflects, or bounces light, but it will not refract light.

Invention:

Background Information:

The first person to discover that ordinary daylight was really a combination of bright colors was Sir Isaac Newton. While he was experimenting with telescopes he first noticed the colors of the spectrum—the same colors we see in a rainbow! He discovered that a ray of light entering his darkened laboratory, when refracted through a prism, was split up into these colors.

The sunlight is made up of seven colors: red, orange, yellow, green, blue, blue-violet, and violet. When this spectrum shines down on us as ordinary sunlight it becomes white light. When white light passes through a prism, it is refracted or split into the separate colors of the spectrum.

Application:

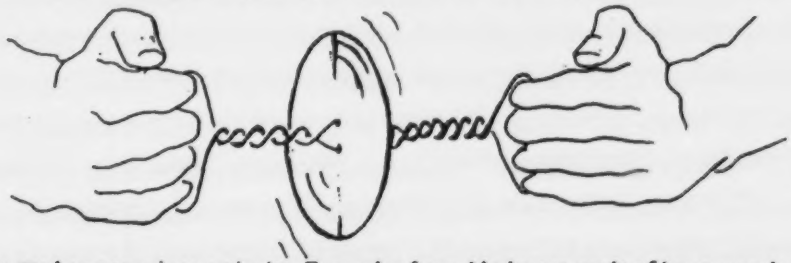
Tell students today we are going to conduct a simple test to find out for ourselves that when these colors are put together they produce white light.

1. Give students a copy of the disc on page 41. The disc works best if copied on heavy card stock paper.

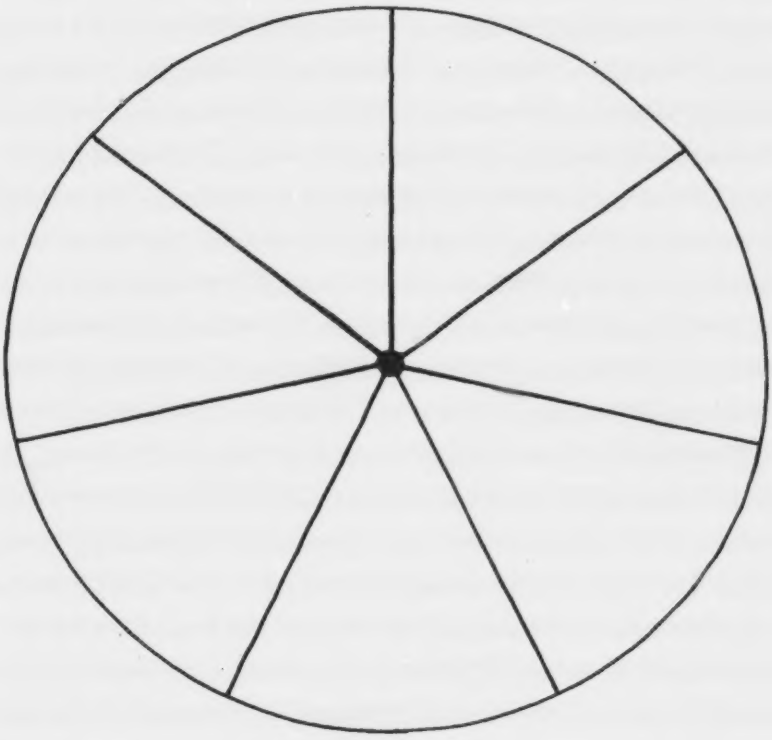
2. Using watercolors paint each section of the disc the colors of the spectrum (red, orange, yellow, green, blue, blue-violet, and violet). Students can mix violet (purple) with blue to make the blue-violet color (once called "indigo" by Isaac Newton). Allow time to dry.

3. Now make two holes near the center of the disc about 1/2 inch apart. Pass the string or thread (3 1/2 feet in length) through the two holes in the middle of the disc and tie the ends together.

4. Hold the string by the loops at each end and get a friend to slide the disc till it is midway between your hands. Now twist the disc around until it is tightly twisted (see figure) and pull gently on the loops. What happens to the colors? What do you see? To enhance the effect, shine a flashlight or other bright light on the disc as it is twisted.



"Buzz"--a whirling disc used as a toy since antiquity. Examples from Alaska are made of bone, wood, and stone; from Zuni the discs are made of dried gourd; from the Mono in California, pottery; from the Maricopa in Arizona, wood; in several locations, discs are also made from shell.



Examples given are variations created by Benham, Fechner and Helmholtz. Students can create their own patterns in black and white or color for a variety of effects when disc is spinning.

Science

As a Matter of Fact

Objectives:

Students will understand that matter can change and that heat is a form of energy.

Materials:

- firing clay
- string
- paper towels
- plastic sandwich bags (one for each child)
- hair dryers
- butter knives

Note: Use firing clay rather than modeling clay. Modeling clay contains oils which will not evaporate like water.

Exploration:

Show students a hunk of clay. Ask the students: How can we make an animal or a bowl out of this chunk of clay? How can we change this into what we want it to be? Pass out small portions of clay. Use string to help cut it apart. Allow them to experiment.

Seminar:

Let individual students share with the class what they did. How did you get your clay to change?

Invention:

Discuss with class how we changed the clay with our hands. Tell them we manipulated or made the clay change by using our energy. Energy is needed whenever something is changed. Crumple a piece of paper. It has a new shape, so it changed. Crumpling the paper took energy. Push a student in a chair from one place to another. Moving the student is a change; and like all changes, that took energy. Ask students to describe additional examples of energy being used to cause change. Every change requires energy.

Energy comes from various objects and in different forms. For example, energy comes from the Sun in a form we call sunlight which warms our bodies, helps make plants grow, and heats the Earth. Energy from the Sun is needed for all of these changes. Energy from the Sun can also be used to bake the clay pieces that the students made. Instead of using the Sun, we could use an oven or other heat source to bake the clay. When the clay is baked, it hardens; it changes. In this case the energy came from the oven instead of from the Sun.

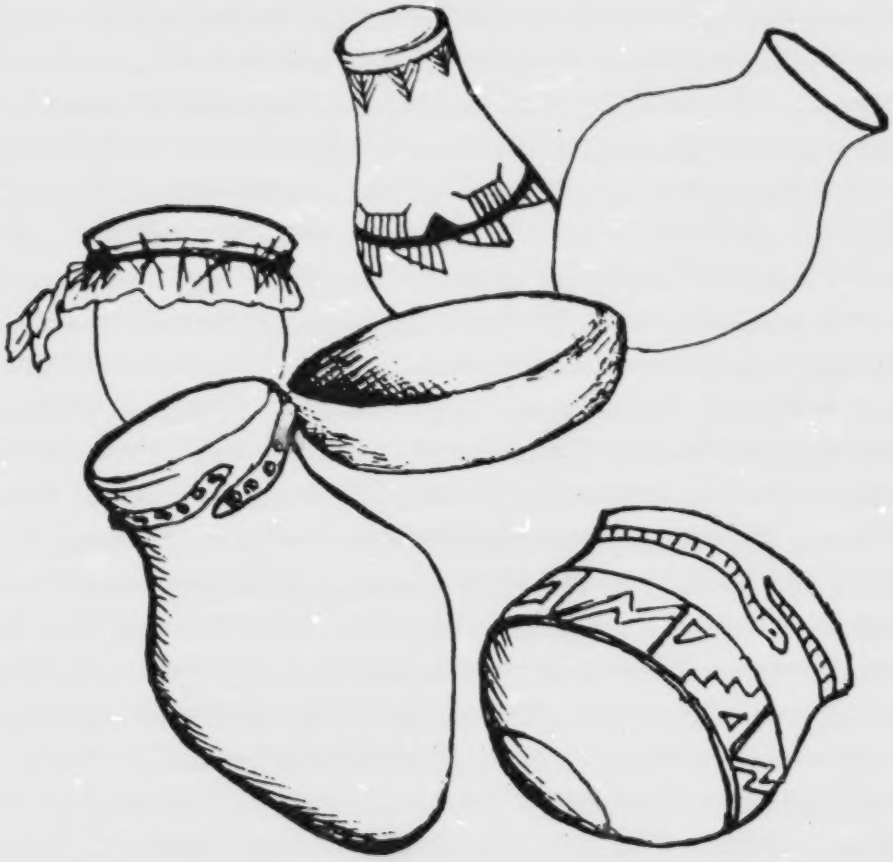
Application:

Break students up into groups of four or five. Give them each a small, thin piece of clay. Let them take turns using the hair dryer to dry the clay. Discuss results of the drying and hardening. Was energy used? What provided the energy? What received the energy?

Then have students use their original piece of clay to make a bowl or pot-shaped item. Place them in open plastic bags. Set them in the sun to dry and harden. Discuss changes in appearance and texture after three or four days of drying. In rainy or snowy weather, heat energy can be obtained from bright lights.

Extension:

Advanced readers or the teacher could read: *Maria, the Potter of San Ildefonso* by Alice Lee Marriott, University of Oklahoma Press, Norman, Oklahoma, 1967. Report to the class about Maria's rediscovery of her people's technique for making the beautiful black pottery we enjoy and admire today.



Navajo pottery from the archives and collection of
The Laboratory of Anthropology, Santa Fe, NM.

SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN INDIAN ART UNIT –

Standard – Understands the convictions scientists share about the nature of the world and what can be learned about it
Benchmarks-
Understands that the same scientific investigation often gives slightly different results when it is carried out by different persons, or at different times or places; however, if the results of repeated experiments are very different, something must be wrong with the design of the investigation
Understands that scientists often repeat an experiment many times before accepting a consistent result as true

Standard – Understands that scientific inquiry works in particular ways
Benchmarks-
Understands the many forms scientific investigation can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up by evidence

Standard – Understands basic concepts about the structure of matter
Benchmarks-
Knows that materials can exist in different states (solid, liquid, gaseous), each having characteristic properties
Knows that some properties of material may be changed by external actions like heating and cooling, but different materials respond differently to the same actions
Knows that when a new material is made by combining two or more materials, as in a chemical transformation, the material can have properties that are different from the original materials

Standard – Knows the forms energy takes, its transformations from one form to another, and its relationship to matter
Benchmarks-
Knows that things that give off light often give off heat
Knows that mechanical and electrical machines give off heat
Knows that when warmer things are put with cooler ones, the warm ones lose heat and the cool ones gain it until they are all at the same temperature

Standard – Understands motion and the principles that explain it
Benchmarks-
Knows that light from the sun is made up of a mixture of many different colors of light, even though to the eye the light looks almost white

Standard – Understands cycling of matter and energy flow through the environment
Benchmarks-
Knows that some source of "energy" is needed for any work to be done

Standard – Understands the nature of physical, conceptual, and mathematical models and the uses made of them
Benchmarks-
Knows that seeing how a model works after something is done to it, such as changing some of its parts, may suggest how the real thing will work if the same is done to it
Knows that geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and even stories can be used to represent objects, events, and processes in the real world, although these representations can never be exact in every detail

Standard – Knows about patterns of change and constancy
Benchmarks-
Knows that things change in steady, repetitive, or irregular ways, or sometimes in more than one way at the same time, and that a table or graph of observations or measurements often is the best way to tell which kinds of change are happening
Knows that a system may stay the same because nothing is happening to it or because the things happening to it exactly counterbalance one another

AMERICAN INDIAN CONTENT STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN INDIAN ART UNIT –

Science as Inquiry –
Indian students should develop the ability to articulate examples of the scientific inquiry necessary to develop and improve technologies employed by early American Indians, such as tempered pottery.

Physical Science -
Indian students should develop an understanding of the principle of changes of properties in materials applied in the daily activities of early Indians, such as evidenced in the preparation of wood splints for basketry, the production of glue from the hooves of a deer and the preparation of natural dyes.

Earth Science –
Indian students should develop an understanding of properties of earth, air, water and fire and how they served as a basis for traditional American Indian production of clothing, housing, tools, and art objects.

Science and Technology –
Indian students should develop an awareness of the problem solving skills demonstrated by historical American Indians in the development of tools and technologies such as in pottery technology – e.g., types of clay, tempering, firing techniques, decorative techniques.

History and Nature of Science –
Indian students should develop an understanding of ways in which reasoning, insight, energy, skill and creativity were demonstrated in the scientific achievements of early American Indians.

American Indian Content Standards, ORBIS Associates for the Office of Indian Education Programs, Bureau of Indian Affairs, 1996.

EARTH, AIR, WATER AND FIRE

Teacher's/Parent's Background Information -

This unit is about earth, air, water, and fire, the four elements or sometimes referred to as the Four Ancestors by Indian people. These four elements are gifts and must be used and treated with respect. Consider again the following attributed to Chief Seattle:

> Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experience of my people. Teach your children what we have taught our children, that the Earth is our mother. The rivers are our brothers, they quench our thirst and feed our children. The air is precious to the red man, for all things share the same breath – the beast, the tree, the man, they all share the same breath. And what is man without the beasts? If all the beasts were gone, men would die from a loneliness of spirit.
>
> This we know. The Earth does not belong to man; man belongs to the Earth. Man did not weave the web of life, he is merely a strand in it. Whatever he does to the web, he does to himself. All things are connected like the blood which unites one family. All things are connected.

The four elements, all natural resources, react with one another and in this way are interrelated and interconnected. All natural resources are connected. Students must learn how the elements act and react with one another and learn to respect and care for them.

We must work hard to preserve our earth, the air and the water. We cannot keep dumping waste in the oceans, rivers, and on our land. Disposal of garbage is a critical environmental issue in our society today. Every day each one of us generates nearly four pounds of trash. Much of this waste ends up in our landfills. Nearly 50% of the waste system is composed of recyclable materials. By reusing objects before throwing them away, composting, and recycling, everyone can significantly decrease the amount of waste sent to landfills.

Each day more and more waste is sent to landfills. Landfills are quickly filling up, and it is becoming very difficult to find new landfills because nobody wants a landfill in their "backyard." It costs a lot of money to get rid of garbage and the environmental cost is very expensive, too. Once the land has been used for a landfill, it can't be used as a site for public housing, for example.

Because of human intelligence and our ability to alter the earth, we are unique among living things in being powerful determiners of the global environment. In our hands rests the responsibility to preserve the life-sustaining power of the earth – our home that gives us everything from drinking water to the ephemeral beauty of a dew-covered flower petal glistening quicksilver in the morning rays of sunlight.

Indian people have been called upon to help solve the global warming problem because of their understanding and respect for Mother Earth. North American Indian stories can help us learn how to care for the earth. Through their combined knowledge we can help children discover their own roles in maintaining this fragile balance for themselves and all living things in the generations to come (Bruchac and Caduto, 1989). Mother Earth is our home and we, her children, must endeavor to preserve her resources for our future generations.

The respect for Mother Earth is rapidly fading in today's society. We ignore the crucial importance of recycling and the importance of preserving our resources. About 20 countries are currently water-scarce or water-short. The number is to double by 2020 (United Nations). The need to recycle and care for Mother Earth has to be taught to all ages and to all mankind.

-1994 Math/Science Workshop, Haskell Indian Nations University

This unit might be conducted around the time of Earth Day.

LITERATURE FOR EARTH, AIR, WATER AND FIRE UNIT –

Four Ancestors, Stories, Songs and Poems from Native North America by Joseph Bruchac (**Indian Author**), Bridgewater, 1996. About Earth, Air, Water and Fire.

If You Are a Hunter of Fossils by Byrd Baylor.

The Worry Stone by Marianne Dengler, Rising Moon, 1996.

Arrowheads and Stone Artifacts by C. G. Yeager.

Old Man Coyote and the Rock, **Pawnee**, and Tunka-Shila, Grandfather Rock, **Lakota**, in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988.

Coyote and Rock and other Lushootseed Stories by Vi Hilbert (**Indian Author**). **Skagit Audio Tape**

Legend of the White Buffalo Woman by Paul Goble, National Geographic Society, 1998. **Lakota** The sacred pipe is made of special stone.

Earth is on Big Turtle's Back by Gretchen Will Mayo.

Black Hills, Sacred Hills by Tom Charging Eagle (**Indian Author**) and Ron Zeilinger, Tipi Press, 1987.

A God on Every Mountain Top by Byrd Baylor, Scribner's Sons, 1981. **Southwest**

Between Earth and Sky, Legends of Native American Sacred Places by Joseph Bruchac (**Indian Author**).

The Land in Our Voices, Our Land by Stephen Trimble and Harvey Lloyd, Northland, 1986. **Southwest**

Land and Remember the Land in Between Sacred Mountains: **Navajo** Stories and Lessons from the Land, Rock Point Community School, 1982.

Red Ribbons for Emma, New Seed Press, 1981. **Navajo** Fight to protect the land.

And Still the Turtle Watched by Sheila MacGill-Callahan.

The Indian Way – Learning to Communicate with Mother Earth by Gary McLain.

The Talking Earth by Jean Craighead George, Harper Trophy, 1987. **Seminole**

Gluscabi and the Wind Eagle, **Abenaki**, and Spring Defeats Winter, **Seneca**, in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988.

How Can One Sell the Air? Chief Seattle's Vision (**Indian Author**) by Eli Gifford and R. Michael Cook, Book Pub. Co., 1992. **Suquamish**

Snail Girl Brings Water: A **Navajo** Story by Geri Keams (**Indian Author**), Rising Moon.

How Thunder and Earthquake Made Ocean, **Yurok**, The Hero Twins and the Swallower of Clouds, **Zuni**, Koluscap and the Water Monster, **Micmac**, How Raven Made the Tides, **Tsimshian**, and Sedna, the Woman Under the Sea, **Inuit**, in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988.

Sing Down the Rain by Judi Moreillon, Kiva. **Tohono O'odham**

The **Taos** Indians and Their Sacred Blue Lake by Marcia Keegan, 1975. **Pueblo**

Coyote and Grasshopper by Gloria Dominic, Troll, 1996. **Pomo**

Coyote Takes Water from the Frog People by Barry Lopez in American Indian Myths and Legends by Richard Erdoes and Alfonso Ortiz (**Indian Author**), Pantheon, 1984.

Seya's Song, A **Northwest** Story Using S'klallam Words by Ron Hirschi.

Blue Dawn, **Pueblo**, in Keepers of Life by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1998.

Muskrat Will Be Swimming by Cheryl Savageau (**Indian Author**), Northland Press.

Little Firefly by Terri Cohlene, Troll, 1990. **Algonquian**

Loo-Wit, the Fire Keeper in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988. **Nisqually**

Moth, the Fire Dancer in Keepers of the Night by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1994.

Keeper of Fire, Montana Council for Indian Education Books, Billings.

Cheyenne Fire Fighters by Henry Tall Bull and Tom Weist (**Indian Author**), Montana Council for Indian Education, Billings, 1971.

CHECK YOUR LIBRARY AND BOOKSTORES FOR OTHER BOOKS ON THIS TOPIC.

ACTIVITIES FOR EARTH, AIR, WATER AND FIRE UNIT –

1. Have the students read nonfiction selections about earth, air, water and fire and summarize and report their findings.

2. Have the students read legends about earth, air, water and fire and retell them in the oral tradition, respond and determine the accuracy of legends if from the local tribe.

3. Have the students read fiction including earth, air, water and fire and respond to the reading including indicating the importance of earth, air, water or fire in the story.

4. Have the students read songs and poems about earth, air, water and fire and memorize and recite them to the class/school or parents.

5. Have the students learn how the earth is viewed and honored by their local tribe(s) and how the earth (rocks, soil) was used in the making of some traditional item or in some traditional process.

6. Have the students learn how air is viewed and honored by their local tribe(s) and how air was used in the making of some traditional item or in some traditional process.

7. Have the students learn how water is viewed and honored by their local tribe(s) and how water was used in the making of some traditional item or in some traditional process. Stress water safety. Have students give presentations with visuals.

8. Have the students learn how fire is viewed and honored by their local tribe(s) and how fire was used in the making of some traditional item or in some traditional process. Stress fire safety. Have students five presentations with visuals.

9. Have the students learn if their town/reservation has some particular threat to the earth, air, or water and if waste is being disposed of properly. Have students figure how much it would cost if they had to drink bottled water for a year.

10. Have the students discuss and learn the importance of recycling and practice it. Have students figure the approximate weight of trash from all the school's classrooms for a year. Have them approximate how much of that trash could be recycled.

11. Have the students make Earth Day posters and displays for their school and other public buildings. Have students give presentations on the importance of recycling.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University or through the Math and Science Teachers for Reservation Schools (MASTERS) Project at the University of Kansas. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

MATH AND SCIENCE --

"GRANDFATHER ROCK AND HIS CHILDREN"

CULTURAL OUTCOMES: II, V
MATH OUTCOME: VI
SCIENCE OUTCOME: IV

CULTURAL OBJECTIVE:

Students will understand that Mother Earth provides the material essentials for supporting life on earth.

MATH OBJECTIVES:

Students will:

measure the length and weight of objects by using metric and standard units of measurement

choose an appropriate unit of weight for a given object

apply the concept of conversion in measurement

find equivalent linear units within standard units.

SCIENCE OBJECTIVES:

Students will:

identify the causes of rock, mineral and fossil formation

identify and describe the forces that change the earth's surface

describe changes that affect the earth's crust.

TEACHER'S BACKGROUND INFORMATION:

Read the story, "Tunka-shila, Grandfather Rock," from Keepers of the Earth, p. 57. The following is a synopsis of the story:

The Lakota Sioux say that in the beginning all things existed as spirits and that they were moving about in space hunting for a place to begin creation. They traveled to the sun, but it was too hot. Finally, they came down to Earth, and found it to be covered with water and there was no place to start life. But, out of the water a great burning rock rose up, and from it dry land appeared, and clouds formed from the steam the rock created. Now life on Earth could begin.

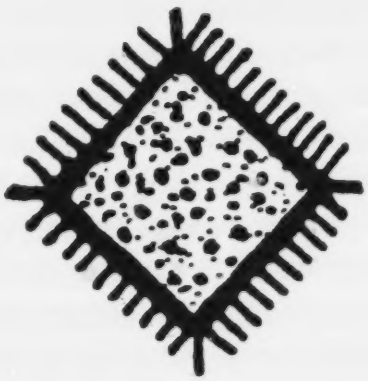
The rock was called "Tunka-shila," which means "Grandfather Rock," because of its great age. Grandfather Rock was burning when he rose up from beneath the ocean. Grandfather Rock was a volcano. He came from a place where the Earth's crust was very thin. From this place, we have three kinds of rock:

The molten magma of a volcanic eruption cools and forms igneous rocks.

Sand, silt, and gravel from grandfather's slopes are carried to lakes, rivers, and streams. These broken pieces settle into the ground, forming sedimentary rocks.

Pressure and heat on the sedimentary rocks (over thousands of years) transforms them into metamorphic rocks.

Grandfather Rock will always be respected for he gave the spirit beings a place to begin life, and he gave man the solid parts of the Earth.



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STUDENT LEARNING ACTIVITIES:

1. Have the students discuss why Grandfather Rock must always be respected.

2. Discuss and identify the three major rock types (igneous, sedimentary, and metamorphic) discussed in this story. Identify and describe their methods of formation.

3. Take a field trip to search for the three major rock types. Look for Grandfather Rock on a map of the student's local area. The students will identify and discuss the properties of the rocks they find and label them according to type.

4. Measurement-Making Fudge

   Have students measure out the ingredients for the fudge used in Activity 5. Do not actually combine the ingredients at this time.

   Ingredients:

3 cups	sugar
3/4 cup	butter or margarine
2/3 cup	evaporated milk
1 teapsoon	vanilla
12 ounce package	semi-sweet chocolate chips
7 ounce jar	marshmallow creme

5. Have the students use fudge to demonstrate the formation of the three types of rocks. Students should examine their "rocks" with a hand lens and record their observations at each stage of the "rock" formation.

   a. To demonstrate the formation of igneous rocks from magma, have the students prepare fudge . As the fudge cools, it forms many small crystals, resembling granite.

      Directions:

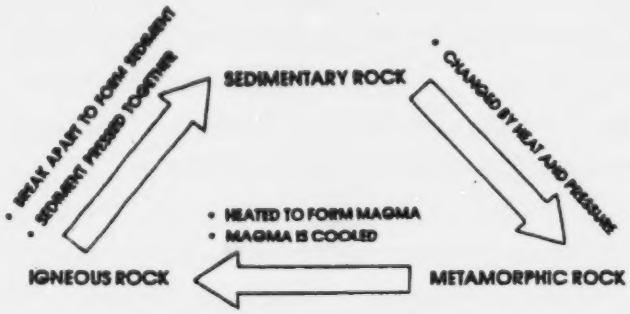
      Stir together butter or margarine, sugar, and milk in a heavy pan, and bring to a full boil. Reduce heat, and stir contents over medium heat for five minutes, or until the contents reach 234° F. on a candy thermometer. Remove from heat and stir in the chocolate chips. Add the remaining ingredients and mix well. Pour into a greased 13" x 9" pan and let cool.

b. *To demonstrate the formation of sedimentary rocks from various* sediments, combine fudge crumbles, chocolate chips, piñon, and marshmallow pieces, etc., and press them together until they form a solid mass. This would resemble a sedimentary rock.

c. To demonstrate the formation of metamorphic rocks by pressure, have half the class take their "sedimentary rock" and place it between large sheets of waxed paper with two large, heavy books on it, and then sit on it for a few minutes. Remove the books, and examine the "metamorphic rock" they have formed by applying pressure.

d. To demonstrate the formation of metamorphic rocks by heat, have the other half of the class place their "sedimentary rock" in a sauce pan, and carefully heat it over sterno or a hot plate. Remove it from the heat after a few minutes, cool it, and examine the "metamorphic rock" they have formed by applying heat.

e. After all comparisons and observations have been made, students may eat their "rocks."



EVALUATION:

1. Have students differentiate between granite and breccia by observing crystal size.

2. Have students write a short essay explaining how igneous, sedimentary and metamorphic rocks are formed.

3. Have students create a mural showing Grandfather Rock emerging from the waters of ancient Earth.

RESOURCES:

Caduto, Michael J. and Joseph Burchac. Keepers of the Earth: Native American Stories and Environmental Activities for Children. Golden, Colorado: Fulcrum, 1989, p. 57.

DEVELOPED BY:

Renata Griego
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MATH AND SCIENCE --

"WIND, AIR PRESSURE AND WEATHER"

CULTURAL OUTCOME: II
MATH OUTCOME: VI
SCIENCE OUTCOME: IV

CULTURAL OBJECTIVE:

Students will understand the importance which Native Americans place on wind and weather.

MATH OBJECTIVES:

Students will:

identify the radius and diameter of a circle

read a therometer using Fahrenheit and Celsius readings

apply the concept of conversion in measurement

contrast Fahrenheit and Celsius readings.

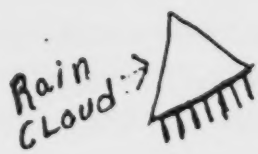
SCIENCE OBJECTIVES:

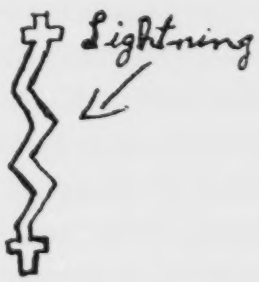
Students will:

observe and measure changes in weather conditions

identify factors which cause changes in weather

explain how weather can be predicted.





TEACHER'S BACKGROUND INFORMATION:

A good way to introduce the Native American beliefs about weather is through a poem written by George Blueeyes.

We say Nahasdzaan Shima:
Earth, My Mother.
We are made from her.
Even though she takes us daily,
We will become part of her again.
For we ARE her.

The Earth is Out Mother.
The Sky is Our Father.
Just as a man gives his wife beautiful
things to wear,
So Our Father Sky does the same.
He sends rain down on Mother Earth,
And because of the rain the plants grow,
And flowers appear of many different colors.
She in turn provides food for him.

He dresses her as a man would dress
his woman.
He moves clouds and male rain.
He moves dark mists and female rain.
Dark mists cloak the ground,
And plants grow with many colored blossoms.

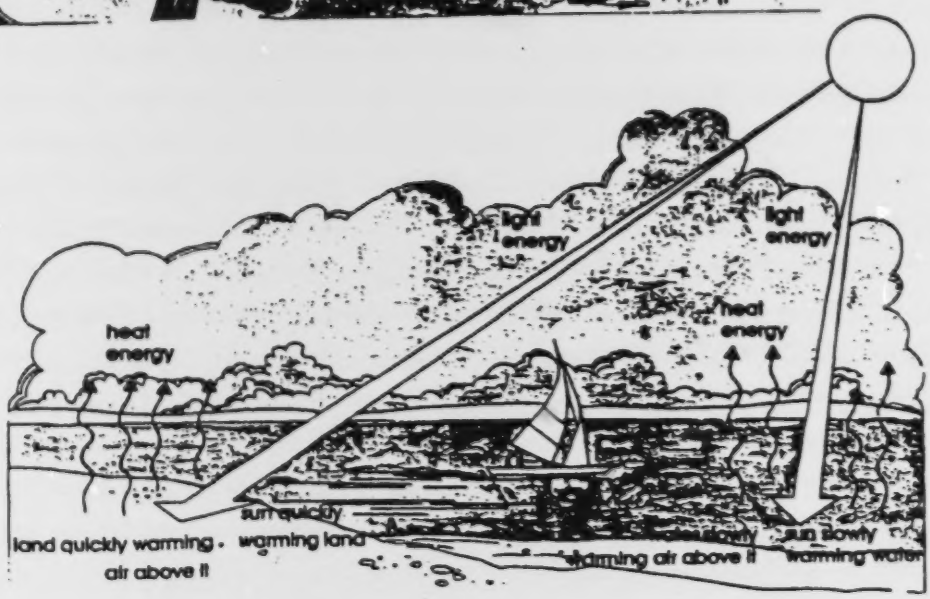
The plants with colored blossoms are her dress.
It wears out. Yes, the earth's cover wears out.
The plants ripen and fade away in the fall.
Then in the spring when the rains come again,
Mother Earth once again puts on her finery.
The plants are restored again in beauty.
This is what the stories of the Elders day.

– George Blueeyes

Use the story "Gluscabi and the Wind Eagle," found in Keepers of the Earth. (pp. 67-71, including discussion questions). In this story, Gluscabi plays a trick on Wind Eagle so the wind will cease to blow. He did not know that the wind is important because it cleans the air and keeps it cool. The wind brings the clouds and rain. It also moves water and keeps it fresh and clean. Later, when he realizes the wind's importance, he frees Wind Eagle.

...

Fog is a stratus cloud that is formed near the surface of the earth. When humid air is cooled to its dewpoint, it forms a cloud. The water vapor condenses in the air. The condensed water vapor forms drops of water which surround dust particles. Any air movement will keep the drops from falling to the earth. Thus, a cloud is formed when the temperature changes and there are some dust particles in the air on which moisture condenses. When these droplets enlarger, the result is rain.



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STUDENT LEARNING ACTIVITIES:

1. Smell the perfume.

   On a cool day, have students sit on the floor, stand, or stand on a chair on the opposite side of the room. Spray perfume by the door; then open the door. Ask students to observe who is able to smell the perfume first. Was he or she standing? This activity will lead to a discussion on air currents and the relative density of cold and warm air.

2. Make Fog.

   Demonstrate to the class how fog is formed by using a small bottle with a narrow mouth, ice cubes, and hot water.

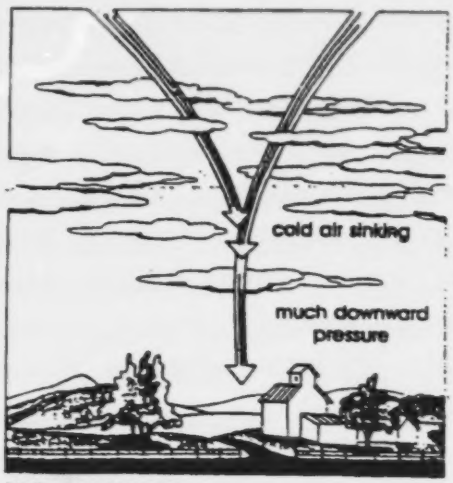
   Fill a small narrow-mouthed bottle with hot water and pour some of the water out so that only 1 1/2 or 2 inches of hot water remains in the bottom. Place an ice cube on the mouth of the jar. Look at it in the sunlight or lamplight. Discuss the findings.

3. Explore the formation of clouds.

   Demonstrate to the class how clouds are formed by using a gallon bottle, a rubber stopper with an opening, ice cubes, chalk dust, hot water, and a bicycle pump.

   Add about 2 inches of hot water to a gallon jar. Let it stand for about 20 minutes, so the water vapor will be at the top of the bottle. Shake some chalk dust into the bottle. Close the jar with a one hole rubber stopper. Use five or six strokes from a bicycle pump to fill the bottle with air. The pressure will cause the moisture in the air to condense on the chalk dust. Look at it in sunlight or lamplight.

Low-pressure area



High-pressure area

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EVALUATION:

Evaluation takes place at the completion of each activity.

RESOURCES:

Evers, Larry. Between Sacred Mountains: Navajo Stories and Lessons from the Land. Tucson, Arizona: Sun Tracks and the University of Arizona Press, 1982.

Caduto, Michael J. and Joseph Burchac. Keepers of the Earth: Native American Stories and Environmental Activities for Children. Golden, Colorado: Fulcrum, 1989.

Heil, David. Discover the World. Glenview, Illinois: Scott Foresman, 1992.

Navajo Area Science Curriculum. Bureau of Indian Affairs, Navajo Area Office, Division of Education.

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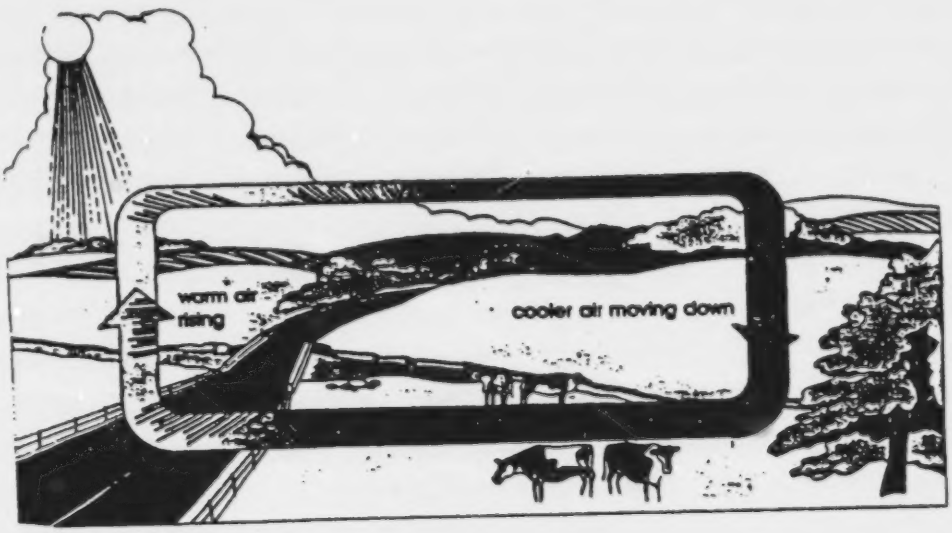

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MATH AND SCIENCE --

" WATER'S HARMONIES"

CULTURAL OUTCOME:	**X**
MATH OUTCOME:	**I**
SCIENCE OUTCOMES:	**VI, VIII**

CULTURAL OBJECTIVE:

Students will understand that the Hopi Flute Ceremony asks all beings to remember the rules of nature and reminds men to follow the Hopi Way. If they do, surely rain will fall.

MATH OBJECTIVES:

Students will:

find the volume of a container

construct simple line or bar graphs, tables and charts

read and interpret a given set of information contained in a table, graph, or chart.

SCIENCE OBJECTIVE:

Students will explain the importance of natural cycles in the ecosystem.

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TEACHER'S BACKGROUND INFORMATION:

The Hopi believe that beings from the underworld played tunes on flutes during their journey up from the underworld. They gave their flutes to their Hopi clan ancestors. Since then, the men in that clan have made music for the Flute Ceremony in summer.

The ceremony takes place in mid-summer, just before the big rain storms. Small rains fall in Hopi land, and they help the corn; nevertheless, as summer goes on, the plants and Mother Earth become very thirsty. The corn needs more water to help the kernels form in the ears and grow fat during the stormiest part of summer. This is the time when the Flute Ceremony reminds everyone and everything that the corn is waiting for the rains to fall.

The Hopi people believe that all things in nature are meant to work together in harmony and peace; however, suppose that someone in the big family of nature does not cooperate. Suppose that one grows greedy, angry, afraid or worst of all, lazy. This behavior will probably cause trouble for everyone.

The Flute Ceremony asks all beings to remember the rules and reminds men to follow the Hopi Way so that rain will surely fall. The leader of the Flute Ceremony enters the plaza and sprinkles corn meal on the ground, forming white patterns on the earth that look like puffy summer clouds.

Children toss little hoops, trying to make them land on cornmeal clouds. The tossing goes on while one of the men sprinkles the crowd with water, using a feather-tipped wand dipped into a bowl he filled at a spring outside the village. The children toss their hoops again and again, while the sprinkling and flute music continue. Rain, rain, rain – the time has come for rain.

STUDENT LEARNING ACTIVITIES:

1. Demonstrate the complete water cycle by showing a picture of the cycle and discussing the inter-related processes. The students should then draw, color, and label the water cycle, using native symbols placed beside science symbols. Students can display their pictures in the hallway.

2. Have the students identify and review the water cycle.

   a. Fill a beaker half full with water and bring it to the boiling point over a flame. Measure and record the amount.

   b. Use tongs to hold a pie plate containing ice cubes directly over the beaker. Students will observe the process of evaporation from the beaker.

   c. After several minutes, the students will observe the underside of the pie plate and describe what is happening. Condensation will occur at this point and they will see the droplets forming on the underside of the plate.

   d. Continue to hold the pie plate over the beaker, and have students observe that the water droplets are falling from the pie plate back into the beaker. Precipitation in the form of rain is occurring at this point.

   e. Discuss the processes the students have just observed. Ask questions concerning the processes, including what caused the ice to melt, why the pie plate was cold even though it was directly over the beaker, and where does the water come from that fell back into the beaker.

   f. Measure the amount of water remaining in the beaker. Ask why the amount changed?

3. Have the students measure and graph their own water consumption for one day. Compare their amount used to national consumption charts.

4. Invite an elder of the tribe to describe the part water plays in their community.

EVALUATION:

1. Ask the students to draw the water cycle and explain the processes of the cycle, using vocabulary words to label each process. (Suggestion: Use colored chalk to construct the water cycle on the chalk board.)

2. Have students expand their ideas or suggestions on water conservation, list them on a chart, and post the chart on the door to the science room.

3. Suggest that students research sources of water pollution in the "Science" section of the school or public library.

4. Read about and discuss the Hopi Flute Ceremony in class. They will discuss their own cultural traditions and compare them with those of the Hopi.

5. Ask the students to define the following vocabulary words:

observation
condensation
cloud
water cycle
precipitation
conservation
evaporation.

RESOURCES:

Elting, Mary. The Hopi Way. New York: M. Ewans and Co., 1969, pp. 46-47.

American Indian Science and Engineering Society. Science Activities For Teachers. 1985-86.

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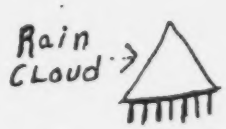

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MATH AND SCIENCE --

"FIRE ENERGIES"

CULTURAL OUTCOMES:	**II, X**
SCIENCE OUTCOMES:	**I, II, IV**
MATH OUTCOMES:	**II, IV**

CULTURAL OBJECTIVE:

Students will understand their relationship to Mother Earth and the importance of fire in Native traditions.

MATH OBJECTIVES:

Students will:

select the appropriate mathematical operation (addition, subtraction, multiplication, or division) and use whole numbers and decimals to solve one-step word problems

measure the length and weight of objects by using metric and standard units of measurement

find the capacity of common containers using standard and metric measurements

choose an appropriate unit of measurement for a given object.

SCIENCE OBJECTIVES:

Students will:

observe that heat energy may be reflected, absorbed, or transferred through an object

compare different sources of energy and identify the benefits and problems associated with each source

investigate the earth's renewal and non-renewable resources

gather information

understand and apply information and concepts

analyze, synthesize and evaluate information.

TEACHER'S BACKGROUND INFORMATION:

Introduce the lesson on fire energies with this legend from the Nisqually Indians of the Pacific Northwest.

"LOO-WIT, THE FIRE KEEPER"

When the world was young, the Creator gave everyone all that was needed to be happy. The weather was always pleasant. There was food for everyone and room for all the people. Despite this, though, two brothers began to quarrel over the land. Each wanted to control it. It reached the point where each brother gathered together a group to support his claim. Soon it appeared there would be war.

The Creator saw this and was not pleased. He waited until the two brothers were asleep one night and carried them into a new country. There a beautiful river flowed and tall mountains rose into the clouds. He woke them just as the sun rose and they looked out from the mountaintop to the land below. They saw what a good place it was.

"Now," the Creator said, "this will be your land." Then he gave each of the brothers a bow and a single arrow. "Shoot your arrow into the air," the Creator said. "Where your arrow falls will be the land of you and your people, and you shall be a great chief there."

The brothers did as they were told. The older brother shot his arrow. It arched over the river and landed to the south in the valley of the Willamette River. There is where he and his people went, and they became the Multnomahs. The younger brother shot his arrow. It flew to the north of the great river. He and his people went there and became the Klickitats.

Then the Creator made a great stone bridge across the river. "This bridge," the Creator said, "is a sign of peace. You and your peoples can visit each other by crossing over this bridge. As long as you remain at peace, as long as your hearts are good, this bridge will stand."

For many seasons, the two people remained at peace. They passed freely back and forth across the Great Stone Bridge. One day, though, the people to the north looked south toward the Willamette and said, "Their lands are better than ours." Another day, the people to the south looked north toward the Klickitat and said, "Their lands are more beautiful than ours." Then, once again, the people began to quarrel.

The Creator saw this and was not pleased. The people were becoming greedy again. Their hearts were becoming bad. The Creator darkened the skies and took fire away.

Now the people grew cold. The rains of autumn began and the people suffered greatly. The people begged the Creator to give them back fire and said they wanted to live together in peace.

Their prayers reached the Creator's heart. There was only one place on Earth where fire still remained. An old woman named Loo-Wit had stayed out of the quarreling and was not greedy. It was in her lodge that fire still burned. So the Creator went to Loo-Wit.

"If you will share your fire with all the people," the Creator said, "I will give you whatever you wish. Tell me what you want."

"I want to be young and beautiful," Loo-Wit said.

"That is the way it will be," said the Creator. "Now take your fire to the Great Stone Bridge above the river. Let all the people come to you and get fire. You must keep the fire burning there to remind people that their hearts must stay good."

The next morning, the skies grew clear and the people saw the sun rise for the first time in many days. The sun shone on the Great Stone Bridge and there the people saw a young woman as beautiful as the sunshine itself. Before her, on the bridge, burned a fire. Loo-Wit gave each of them fire. Now their homes became warm again and peace was everywhere.

One day, though, the chief of the north came to Loo-Wit's fire. He saw how beautiful she was and wanted her to become his wife. At the same time, the chief of the people to the south also saw Loo-Wit's beauty. He, too, wanted to marry her. Loo-Wit could not decide which of the two she liked better. Then the chiefs began to quarrel. Their people took up the quarrel and the fighting began.

When the Creator saw the fighting he became angry. He broke down the Great Stone Bridge. He took each of the two chiefs and changed them into mountains. The chief of the Klickitat became the mountain we now know as Mount Adams. The chief of the Multnomahs became Mount Hood. Even as mountains, they continued to quarrel, throwing flames and stones at each other. In some places, the stones they threw almost blocked the river between them. That is why the Columbia River is so narrow in the place they call the Dalles today.

Loo-Wit was heartbroken over the pain caused by her beauty. She no longer wanted to be a beautiful young woman. She could no longer find peace as a human being.

The Creator took pity on her and changed her into a mountain also, the most beautiful of the mountains. She was placed so that she stood between Mount Adams and Mount Hood, and she was allowed to keep the fire within her which she had once shared on the Great Stone Bridge. Eventually she became known as Mount St. Helens and she slept peacefully.

Though she was asleep, Loo-Wit was still aware, the people said. The Creator had placed her between the two quarreling mountains to keep the peace, and it was intended that humans, too, should look at her beauty and remember to keep their hearts good, to share the land and treat it well. If we human beings do not treat the land with respect, Loo-Wit will wake up and let us know how unhappy she and the Creator have become again. So they said long before the day in the 1980s when Mount St. Helens woke again.

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STUDENT LEARNING ACTIVITIES:

1. After reading the story to the class, discuss the following questions:

   a. Whenever the Creator gives the people what they want, they live in peace for a time, but, what happensevery time the people become dissatisfied?

   b. To what did the fighting lead? What is greed?

   c. What does it mean to share the land?

   d. What is peace?

   e. How is Loo-Wit rewarded for her peace-loving and generous ways?

   f. Why do people become dissatisfied with peace and sharing?

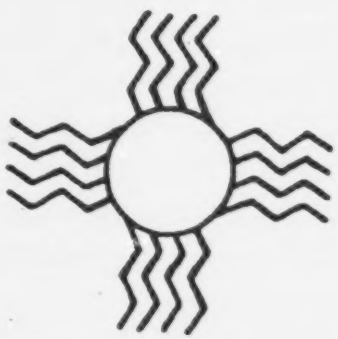
   g. How did they use fire?

   h. What kinds of "fire" or energy do we use today?

   i. Loo-Wit is transformed into the mountain we know as Mt. Saint Helens. Comment on the way she wants people to treat the land, the river, and each other.

   j. What happened to Mt.Saint Helens in the summer of 1980?

   k. What does this mean to the Indians?



2. After the students have analyzed the fire story, discuss the following concepts, using observation and classification skills to organize data. Later, they might work in pairs (under close supervision) to learn how to start fires without matches:

   a. The causes and effects of fire

   b. The potential benefits and hazards of using fire

   c. The fuel, oxygen, and heat required for a fire

   d. Fire safety techniques

   e. The concept and use of friction

   f. The differences between safety and non-safety matches.

3. Perform the "MAGIC MATCH" experiment, using strike-anywhere matches, safety matches, a glass, a piece of sandpaper, hand lens (optional), flint and steel striker (optional), solar heater (optional).

   a. Ask the students what components they think are needed for a fire, then list items such as wood, paper, gasoline, gas, stove gas, hair, air, oxygen, matches, on the chalkboard, then categorize these items under appropriate headings.

      Ask students what actions can create fire, such as the friction between flint and steel or rubbing two sticks together. The contribution of solar energy to fire can be demonstrated by a hand lens and a piece of paper.

   b. We know a burning match can start a fire. But, how does the match get started? (It requires heat, fuel, and oxygen.) Hold up a non-safety or strike-anywhere match or use an enlarged drawing for the students to examine, and ask these basic questions:

      What do you think it uses for fuel?
      (Cardboard or wood and its "head")

      Where does it get its oxygen?
      (Air)

      Where does it get the heat to get started?
      (Friction)

c. Distribute sandpaper so that students can rub their fingers lightly against the palm of their hands until they feel heat, then rub their fingers lightly against the piece of sandpaper until they notice that the sandpaper makes their fingers even warmer.

Point out that when two objects are rubbed together, friction occurs and heat is formed. When the match head is rubbed against something, friction occurs, and the match head gets warm.

d. Rub the non-safety match against a glass or window pane and ask students why it doesn't ignite. (There is not enough friction because the glass is smooth.) Then rub it against the sandpaper until it ignites and ask why.

Explain that a match contains everything necessary for a chain reaction which may be compared to the domino effect where one domino falls and the rest follows. To create the reaction, the head is rubbed against something rough. Friction occurs and heat is released. The small amount of heat that is released causes a chemical (a phosphorus compound) in the head to ignite and a small flame develops. This flame is hot enough to cause a second chemical (potassium chlorate) to release oxygen. The oxygen makes the flame hotter and causes a third chemical (sulfur) to begin burning. The burning sulfur gives the match its odor. Once the head is burning, the heat causes a wax coating to melt and it starts to burn. By then, the fire is hot enough for wood or cardboard to burn on its own. The chemicals that helped the match get started are quickly consumed.

Explain that a safety match contains all the chemicals the strike-anywhere match has except one (the phosphorus compound). That chemical is the one that starts the chain reaction. That missing chemical is located on the match box or folder. Demonstrate that when the safety match heads is rubbed against the chemical, mixed with a grit to increase friction, the chain reaction begins.

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4. Conduct the "FIRE BRIGHT – FIRE OUT" experiment with the use of one large demonstration candle and one small candle, one small test tube, aluminum foil, matches, and an eye dropper for each group of students.

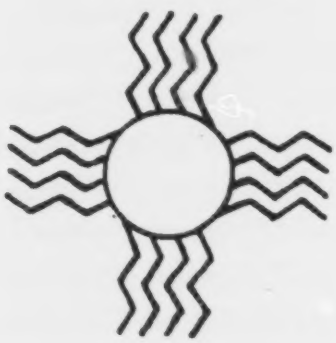
   a. Review the things necessary to start a fire. (Fuel, heat, and oxygen.)

   b. Ask the student how they think a fire can be put out. During the discussion make sure that the students understand that each method involves removing one or more of the necessary ingredients for fire.

   c. Pass out the materials to each group, being sure to give each a piece of aluminum to set their candle on for safety.

   d. Light the students' candles and ask them to observe and describe the candle flame. There are many things to be seen. Allow plenty of time for observation. Turning out the lights can help students concentrate on the flame. Later, students can write or draw their observations.

   e. Have the students lower their test tube mouth-side down over the flame and ask them to observe what happens to the flame. Discuss the fact that the flame used up the oxygen in the test tube and because fire needs oxygen to continue burning, it goes out when the oxygen is depleted.



5. Play "USE IT AND LOSE IT" to help explain renewable and non-renewable energy sources. Use pictures of trees, oil fields, and solar panels, as well as samples of the energy sources such as paper for burning, oil lamp or kerosene lamp, matches, metal pan to burn the paper in, pencils, writing paper, dried beans, large pot, gallon or liter containers.

   Introduce this lesson by telling students that chemical energy can be converted into other forms of energy such as heat, light, and motion. Explain that energy flows through a system and must be replaced once it passes through Describe ways to harness energy to do work. Differentiate between renewable and non-renewable energy sources and learn how to conserve energy.

   a. State that chemical energy can be converted into other forms of energy such as heat, light, and motion and that it can become dispersed in the process.

   b. Demonstrate that chemical energy in stored in a piece of paper, which is made from wood. Place a piece of paper in your large metal pan. Burn the paper and show how the energy is given off as heat and light, reducing the paper to a small pile of ashes. Trees are grown to replace the paper and its energy.

   c. Light the oil lamp. This fuel was formed millions of years ago from the remains of plants and animals and cannot be replaced during one human being's lifetime or for generations to come. Gasoline, natural gas, and other fossil fuels cannot be replaced and they are in limited supply for our world's daily energy needs. Some societies or nations use renewable resources such as wood and animal dung, while many North Americans and people in other industrialized nations use mostly non-renewable resources such as gas, coal, and oil.

   d. Have the students write down some ways that they could use less of each of these three forms of energy: light, heat, (hot water, room heat, cooking heat, etc.) and motion, especially automobiles.

   e. Ask the students to conserve energy for one week and then write a report describing their new behavior.

EVALUATION:

1. Name the three things necessary for fire.

2. Identify the chain reaction that occurs when a match is lit.

3. Describe friction.

4. Demonstrate how to put a out a fire and what elements are removed from the combustion process.

5. Explain renewable and non-renewable resources.

6. Find volumes using fluid measure.

7. Calculate gallons or liters of gasoline consumed and driving mileage of families.

RESOURCES:

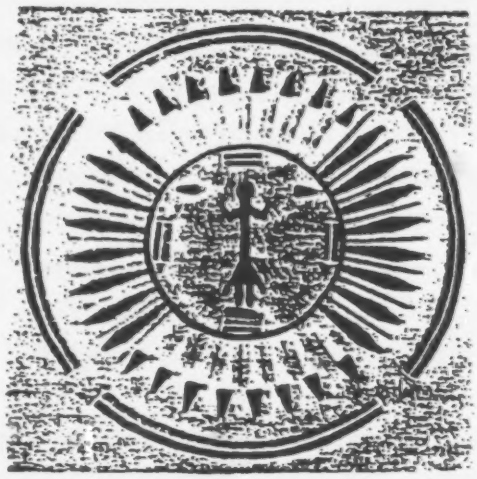
Caduto, Michael J. and Joseph Burchac. Keepers of the Earth: Native American Stories and Environmental Activities for Children. Golden, Colorado: Fulcrum, 1989.

Strongin, Herb. Science on a Shoestring. Menlo Park, California: Addison-Wesley Publishing Company, 1985.

American Indian Science and Engineering Society. Hands On/Minds On: Science Activities for Children. Boulder, Colorado, 1990.

DEVELOPED BY:

Iris Jean Butchee



SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN EARTH, AIR, WATER AND FIRE UNIT-

Standard – Understands the convictions scientists share about the nature of the world and what can be learned about it
Benchmarks-
Understands that the same scientific investigation often gives slightly different results when it is carried out by different persons, or at different times or places; however, if the results of repeated experiments are very different, something must be wrong with the design of the investigation
Understands that scientists often repeat an experiment many times before accepting a consistent result as true

Standard – Understands that scientific inquiry works in particular ways
Benchmarks-
Understands the many forms scientific investigation can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up with evidence

Standard – Knows basic concepts about the earth
Benchmarks-
Knows that when liquid water disappears, it turns into gas (vapor) in the air and can re-appear as a liquid when cooled
Knows that air is a substance that surrounds us, takes up space, and whose movement we feel as wind
Knows that clouds, like fog and steam from a kettle, are made up of tiny droplets of water
Knows common rocks and minerals, what they are made of, and how they form
Knows the major differences between fresh and ocean waters

Standard – Understands the processes that shape the surface of the earth and the relation of the surface of the earth to the living environment
Benchmarks-
Knows that waves, wind, water, and ice change the earth's surface to provide many of the landforms, such as shorelines, cliffs, deserts, and valleys (wind and water can move soil, depositing it downstream in seasonal layers
Knows that smaller rocks come from the breakage and weathering of larger rocks
Knows that soil is made partly from weathered rock and partly from products of plants and animals
Knows that heating and movement within the earth cause earthquakes and volcanoes and create mountains and ocean basins

Standard – Understands basic concepts about the structure of matter
Benchmarks-
Knows that materials can exist in different states (solid, liquid, gaseous, each having characteristic properties
Knows that some properties of materials may be changed by external actions like heating and cooling, but different materials respond differently to the same actions
Knows that when a new material is made by combining two or more materials, as in a chemical transformation, the material can have properties that are different from the original materials

Standard – Knows the forms energy takes, its transformations from one form to another, and its relationship to matter
Benchmarks-
Knows that things that give off light often give off heat
Knows that mechanical and electrical machines give off heat
Knows that when warmer things are put with cooler ones, the warm ones lose heat and the cool ones gain it until they are all at the same temperature

Standard – Understands the cycling of matter and flow of energy through the living environment
Benchmarks-
Knows that some source of "energy" is needed for any work to be done
Knows how matter is cycled and recycled within ecosystems, yet the total amount of matter remains constant, even though its form and location change; that the chemical elements that make up the molecules of living things pass through the food web and are combined and recombined in different ways

Standard – Understands the basic concepts of the evolution of species
Benchmarks-
Knows that fossils provide evidence that some organisms living long ago are now extinct and can be compared to one another and to living organisms according to their similarities and differences

Standard – Understands the nature of the Chemical Revolution
Benchmarks-
Knows that fire – along with air, earth and water – was long believed to be the substance out of which everything else was made; this seems sensible, though no longer believed, because it looks like fire is given off when something burns
Knowing what things are made of, how substances are combined or made to combine is the work of chemists, materials scientists and physicists.
Knows that all materials, including invisible gases, have weight, and the same volume of different substances usually have different weights; weight is a particularly useful – but not the sole property of materials that can be found only by careful measurement with instruments

AMERICAN INDIAN SCIENCE STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN EARTH, AIR, WATER AND FIRE UNIT –

Science As Inquiry –
Indian students should develop the ability to articulate examples of the scientific inquiry necessary to develop and improve technologies employed by early American Indians such as tempered pottery and corn agriculture.

Physical Science-
Indian students should develop an understanding of the principle of changes of properties in materials applied in the daily activities of early Indians such as evidenced in the preparation of wood splints for basketry or the preparation of natural dyes.

Earth Science-
Indian students should develop an understanding of the properties of earth, air, water and fire and how they served as a basis for traditional American Indian production of clothing, housing, tools, and other objects.

Science and Technology-
Indian students should develop an understanding of the technological design process and how it was applied in the development of various tools and technologies employed by early American Indians such as fish weirs, salmon spearing platforms, and road and building construction technologies.

Science in Personal and Social Perspectives-
Indian students should develop an understanding of how environmental degradation may be occurring in their communities and/or on reservation lands.

History and Nature of Science-
Indian students should develop an understanding of ways in which reasoning, insight, energy, skill and creativity were demonstrated in the scientific achievements of early American Indians – architecture, tools, health and medicine.

American Indian Content Standards, ORBIS Associates for the Office of Indian Education Programs, Bureau of Indian Affairs, 1996.

INDIANS' USE OF TREES

Teacher's/Parents's Background Information -

Indians of the past utilized trees for many purposes including building houses and canoes, for tools, for medicine, and for food. An example of the use of trees is that of the Ojibwa and other Woodland Indians for building the birch bark canoe used for transportation and for fishing. There were several different sizes of canoes for different tasks. These ranged from the small two-man river canoe to the large 40-foot, ten-man canoe used for traveling on the Great Lakes.

These canoes were made from sheets of birch bark attached to a wood frame. The pieces of bark were sewn together with fine roots of the cedar or jack pine. When finished the seams were sealed with spruce gum. It took about ten days to complete a canoe, which, if well constructed, would last a year or more. Birch bark, because of its waterproof qualities was also used to make waterproof containers and pots for cooking.

The materials used in making birch bark canoes and for other purposes come from different tissue layers of the tree. The outside covering of a tree is called cork or bark. As the cells of the cork grown, a fatty substance is deposited in the walls of the cells which makes them impervious to water. The fatty substance in the cells and the closeness with which they fit together protects the tree from excessive water loss by evaporation. It is bark's (cork's) waterproof characteristic that makes it an excellent outer covering for canoes.

The cork is produced by the underlying tissue layer called the cork cambium. Cambium is a term used for cell producing layers in plants. Every spring the cork cambium produces a new layer of cork. The next layer inward is the phloem. This is a thin layer of tissue which serves to carry food produced by the leaves down to the roots. The Woodland Indians tapped (and still tap) the phloem layer in maple trees to obtain the sap which they made into maple syrup. Since the phloem lies next to the bark it is often referred to as the inner bark. One method of killing trees is to remove a ring of bark and phloem all the way around the tree. This keeps the food from reaching the roots and causes the roots and the tree to die. This method was used by several different Indian tribes in the East to clear land for planting.

Phloem is produced by the vascular cambium. The outer cells of the vascular cambium divide and become phloem cells. As the inner cells of the vascular cambium divide they form the xylem. Xylem is the actual wood of the tree. In evergreen trees there are resin ducts scattered throughout the xylem. Resin ducts are small ducts that secrete resins. These resins form the gum and pitch that the Ojibwas used to seal the seams of the canoes and birch bark pots. - from Trees: A Multipurpose Resource.

This unit should be used during maple sugaring time or around Arbor Day.

LITERATURE FOR INDIANS' USE OF TREES UNIT –

How the Tree Brothers Gave in Around an Iroquois Storyfire.

The Big Tree and the Little Tree by Jean E. Speare, Pemmican Pub., 1986.

How the Birch Tree Got Its Stripes by Dean Whitestone (Indian Author), Fifth House, 1982. **Cree**

Why Saguaros Grow on the South Side of Hills and We Are Kin to Trees in And It Is Still That Way by Byrd Baylor, Trails West Pub., 1976. **Southwest**

Why Some Trees Are Always Green in Keepers of Life by Michael Caduto and Joseph Bruchac (Indian Author), Fulcrum, 1998. **Cherokee**

How Fox Brought the Forests from the Sky in Keepers of Life. **Snoqualmie**

The Buffalo Bull and the Cedar Tree in Keepers of Life. **Osage**

The Sky Tree in Keepers of Life. **Huron**

The Gifts of the Trees by Ann Hudson Downs, Masinaigan.

Ininatig's Gift of Sugar: Traditional Native Sugarmaking by Laura Waterman Wittstock **(Indian Author)**, We Are Still Here Series, Lerner.

Manabozho and the Maple Trees in Keepers of the Earth by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum, 1988. **Anishinabe**

The Thanks to the Trees in Keepers of Life by Michael Caduto and Joseph Bruchac **(Indian Author)**, Fulcrum, 1998. **Seneca**

Maple Moon by Connie B. Crook, Stoddart Kids, 1998.

The Maple Thanksgiving by Joseph Bruchac **(Indian Author)**, Celebration Press. **Iroquois**

Maple Sugar, **Chippewa** song in The Sky Clears by A. Grove Day, University of Nebraska Press, 1951. Also in American Indian Poetry by George W. Cronyn, 1962.

How the Indians Use Wild Plants for Food, Medicine and Crafts by Frances Densmore, Dover, 1974.

CHECK YOUR LIBRARY AND BOOKSTORES FOR OTHER BOOKS ON THIS TOPIC.

ACTIVITIES FOR INDIANS' USE OF TREES UNIT –

1. Provide introductory information on Indians' use of trees from the teacher's background information.

2. Have students read about how Indians of the past used trees, summarize and report their findings in presentations with visuals.

3. Have students read legends about trees, respond and retell them.

4. Have students determine how Indians of the local area used trees in various ways and how they use them today.

5. Have the students learn about tropical deforestation, acid rain, and old-growth forests.

6. Have the students learn and practice paper recycling.

7. Have the students learn the damage that forest fires cause, not only to trees but also to the animals, etc. Discuss a local fire if there has been one.

8. Have the students participate in Arbor Day activities.

9. Have the students conduct maple sugaring activities in locations where this can be done. Stress careful measuring. Have students sell products.

10. Have students list all the foods and medicines that come from trees, most of them first used by Indian people.

11. Have students learn what foresters, wildlife biologists, game wardens, fire fighters, loggers, recreation specialists, park interpreters, land-use planners, sawmill workers and soil scientists do.

12. Have students learn how trees help provide oxygen.

13. Have students learn to recognize the different kinds of trees in the local area.

14. Have students make small animals out of acorns or other nuts or parts of trees.

15. Have the students discuss and learn how trees have contributed to the economy of the Indian people.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University or through the Math and Science Teachers for Reservation Schools (MASTERS) Project at The University of Kansas. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

SCIENCE --

"IT GROWS AS IT GOES"

CULTURAL OUTCOME: X
SCIENCE OUTCOME: V

CULTURAL OBJECTIVE:

Students will learn about the significance of trees for Native Americans in regard to spiritual and physical survival.

SCIENCE OBJECTIVES:

Students will:

describe plant growth and adaptation to the environment

list characteristics of plants found in the world's major biomes.

TEACHER'S BACKGROUND INFORMATION:

"Waterless Mountain," winner of the Newberry Award for 1932, tells the story of ten-year-old Younger Brother as he grows up to become a Navajo Medicine Man. Before reading this story to the students, help the students acquire a restful mood.

The dominant theme in Waterless Mountain is man's inseparable ties between spiritual and physical life. The insight gained through examination of the environment enables students to better understand the need for people's harmonious relationship with the land.

"ON THE MOUNTAIN TOP"

By Laura Adams Armer

As the company left the hogan Younger Brother and Uncle lingered in the doorway looking toward Waterless Mountain, with its long, straight top purple against the sky. The boy said, "I have never been up there. I think I should like to go."

"I have never been on top," said Uncle, "but I know there is spruce growing there. I think we should go, you and I."

The boy was very happy at the thought. For the next two days he helped Uncle get ready for the trip. They decided to take one pack animal to carry the blankets and sheepskins, food and a keg of water. Each rider had a small canteen of water tied to his saddle for Uncle said:

"We travel in a country without springs. We Navahos call it the Waterless Mountain, because on its top and on all of its sides there is not one spring; but no one knows what may be in its heart. There are six directions always, east, south, west, north, above, and below. Below is the deep heart of things."

As Uncle and Younger Brother rode up the wash, the boy kept thinking of what Uncle had said.

"Who knows what may be in its heart."

Deep, deep down under the earth were many mysteries and the source of many wonders. Uncle had told him of the Water People, who kept the rainbows in the heart of the earth, to send to the Sky People when they needed them to travel on.

As the two passed at the bottom of the cliffs on whose top was the big pool that poured its water down through the pipe, Younger Brother said to Uncle:

"It must come from some higher place," said Uncle.

"There is no higher place in sight except the Waterless Mountain."

"That is true, but what of it, child?"

"I was thinking about the deep heart of things. Maybe the Waterless Mountain has a pool buried in the deep below. Maybe it sends a river underground to the pool of the mesa."

Uncle looked at the boy with pride and said:

"Once you sang a new song. I knew then you were made to follow me. Now you have spoken wisdom about the beginning of things, and the water from whence we came."

"I speak only as my heart sings. Sometimes it sings till I feel pain deep down. Why should that be, Uncle?"

"There are some truths you are yet too young to know, Little Singer. It is better that you watch your pony now as we climb the loose rocks. Soon we shall camp for the night."

After another hour's riding, the two made camp in a sandy hollow among the rocks, where one lone juniper tree lifted its dark branches above twisted gray roots.

Uncle hung the bridles on the juniper limbs, piled the saddles at its base, and put the water keg where Younger Brother could pour water for cooking. Then he tied the three horses about a hundred feet away from the camp.

The boy gathered sagebrush and juniper bark for the fire, while Uncle lay down on the sand to smoke the cigarette he had rolled in a corn husk.

While Younger Brother spread the sheepskins on the ground, the coffee boiled on the fire and the mutton ribs sizzled. Both the travelers were hungry. They liked the cold tomatoes eaten right out of the can. They went fine with the mutton.

By the time dusk had settled on the hills around, Uncle and Younger Brother lay back on the sheepskins with their feet to the fire and talked of the wonders the boy had seen at the wide water.

"I have saved the jar of water you brought. I shall need it at the next dance of the Yays, when the white earth will be mixed with the western water to make the paint for their bodies.

"I am glad I brought it, Uncle."

The boy was watching the stars appear in the blue-black sky.

"Did you once tell me that Coyote put the lights in the sky?"

"Yes, First Man asked him to because the moon was not there every night and it was too dark. First Man planned the big star in the north, the star that never moves, and he planned the seven stars that move around it there."

"What did he make the stars of?" asked Younger Brother as he lay on his back watching the bright spots sparkling above.

"They were made of pieces of shining mica. First Man drew a plan on the sand, putting the mica in the places where he wanted the stars to be in the sky. Then along came Coyote and said, 'I want these three red pieces for my very own.'

" 'All right,' said First Man, 'but help me throw them all up in the right place.'"

"So they threw the big pieces of mica up against the dark sky and they stuck just where they wanted them to. After Coyote had placed his three red ones he was no longer interested so he just took all the mica that was left and placed it in his hands and blew on it."

"Puff, puff, he blew, and all the sparkling mica went up and stuck to the sky most anywhere. That is why we do not know the names of all the stars. They have no names because they never did have."

"It doesn't matter very much about names, Uncle, so long as there are things to think about. If my heart sings, I know it and I couldn't tell anyone the name of the song."

That is because you are made for a real medicine man. We never name the things we sing because that would make them common."

"Is that why mothers do not speak their children's names?"

"That is just the reason. Children are precious and mothers do not want everyone in the world knowing what name sings in the mother's heart."

"Only once, Uncle, has my mother called me by the name she gave me."

"When was that, child?"

"That was when I was sick with heat in the head and when the Big Man came with the sweet yellow fruit. Mother sat on the floor beside me while we were alone. She held my hand in her cool hand and she leaned over me while my eyes were shut and she whispered, 'Hayolkai Aski, my little Dawn Boy.' I liked the name my mother made for me."

"It is a good name. We will not speak it often because we do not want it to lose its power. Now let us sleep, child."

Uncle wrapped the blanket close about him and turned on his side to sleep.

It must have been long after midnight when Uncle was awakened by the distant cry of a prowling beast. He was not familiar with the sound. It was a terrifying yell of some big animal, which drew nearer and nearer to the camp.

Uncle sat up to listen. He looked at Younger Brother sleeping peacefully by the little glowing campfire, totally unaware of the cry that was coming closer.

Uncle lay down again, perfectly still. As he listened he could hear at intervals between the hoarse yelps, the occasional crunching of small branches. He knew the night prowler was approaching. The animal no longer cried. Soon, Uncle saw a large, shadowy form moving about ten feet beyond Younger Brother.

Breathlessly Uncle watched and waited for the lithe figure to move on. With slow, deliberate steps and with head pointed straight forward, the big animal walked on past the camp without further cries.

Uncle knew that the Soft-footed Chief was on the scent of the horses which were tied about a hundred feet away. He rose quietly, seized a piece of juniper bark lying by the coals, dipped it in the fire and lit it, then ran quickly in the direction of the horses. He found them trembling with fear and trying to break away.

In the darkness he could not see the mountain lion but he stood by the horses and waved and waved the firebrand. Soon, as he watched, he saw two glowing eyes shining out of the blackness. He shook the burning bark in front of the eyes until they moved away. Then he uttered a prayer ending with these words:

"Walk away in peace, Soft-footed Chief. Walk on the trail of beauty."

Then Uncle untied the animals and led them to the camp.

"Wake up," he said to Younger Brother. "It is time to make our coffee."

After throwing some sagebrush on the fire, Uncle tied the horses to the lone juniper tree and proceeded to put the saddles on them.

"Why do we wake so early?" asked the sleepy boy.

"I will tell you when the dawn shows in the sky. Now you make the coffee. I feel the need of it."

Younger Brother made the coffee. He was puzzled. His Uncle's hand trembled when he took the coffee cup. He said, "I am just a little cold."

Soon the gray light made things visible and Younger Brother went to gather more fuel for the fire. As he came back he stopped a few feet from where he had been sleeping and examined the sand.

"Uncle," he cried. "Some big animal passed in the night. Here are his tracks."

"Yes, my child. It was the Soft-footed Chief that passed. I spoke to him. I showed him the firebrand. He left, but he might come back."

The boy said excitedly:

"What did he look like, Uncle? Never have I seen him."

"He looked like a mighty chief, the way he walked in slowness, and his voice was more powerful than any I have heard."

"I wish that I too might have seen him."

"It is enough that I saw him. My sister's child already has the power of strong medicine. The beasts walk by him in peace."

Uncle took out his medicine bag and touched the pollen to his tongue and his head, and threw some to the sun, which was just rising in the east. He passed the pollen to Younger Brother, who repeated the ceremony. Each said in his heart the silent prayer to the day.

By the time the sun was just above the horizon, the two riders were well on their way up a narrow gully filled with slabs of bright-colored sandstone and prickly cactus plants.

Uncle said, "The Cactus People always live in a land of mirage and bright rocks. They are a mighty people, who can cure trouble of the skin."

"I should think they could cause trouble, too," said the boy.

When the riders had nearly reached the top of the mountain, Uncle dismounted to pick some stalks of mountain tobacco, which grows only in high altitudes.

"This is for the sacred cigarettes of the Night Chant," he said. "I am glad that I have found it."

He carefully wrapped the stalks in a flour sack and tied the bundle to his saddle. Before very long the top of the mountain was reached. The riders jumped from their horses and sat down to enjoy a quiet smoke.

Looking back to the country they had left the day before, it was hard to realize that they had crossed deep canyons and climbed steep hills. The land lay flattened out in the distance.

Uncle waved his hand in an eloquent gesture from east to south, from west to north. Then pointing, he said:

"There is where my mother's people made war of the Apaches. There is where my father's people took the scalps of the Utes. There is where we captured the Mexicans, and there is where Kit Carson made us take the Long Walk. Some of us hid in the mountains where no Pelicanos have ever been."

"Did any of us hide here?" asked Younger Brother.

"That I cannot say. If there was no water here, it would not be a good hiding place. Let us walk to the north slope and see if any snow is left under the trees."

They found some snow and melted a little over a fire so that the horses could have a good drink. They also filled their keg and canteens with melted snow.

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While doing this Younger Brother noticed a queer little rock sticking out of the pine needles. He picked it up and found fossil sea shells imbedded in it.

"Look," he cried. "The wide water has been here at some time."

"Yes, it must have been here. Of that time I know nothing, but there are bones of ancient monsters in all our land."

Younger Brother put the shells in his pocket. He would give them to Sister when he reached home. Uncle cut some spruce boughs and tied them on the pack horse. The little cavalcade started down the mountain. Uncle said:

"I am glad we came because I need the mountain tobacco and the spruce. But we will go quickly home and not disturb the Soft-footed Chief tonight. I have seen how far spreads the land of my mothers and grandmothers and I feel light and happy within."

The travelers reached home after dark, very glad to rest safely in Mother's warm hogan.

Permission to reprint Chapter 26 of "Waterless Mountain" courtesy of Random House; title transfer courtesy of David McKay Co.

STUDENT LEARNING ACTIVITIES:

Student activities are included that help students understand the following: how tree growth is recorded, what kinds of leaves trees have, how people get clothes and shelter from trees, and how trees provide oxygen.

1. Read the story and discuss the following:

a. Uncle's mention of spruce at the beginning of the story tell us something about the land being visited.

Spruce trees live at higher elevations than the Upper Sonoran zone where Younger Brother lives. This biome, also known as the Piñon-Juniper zone, ranges from 4,500 to 8,500 feet above sea level.

Of the ten varieties of spruce, the author was most likely referring to Blue Spruce or Engelman Spruce, both native to the Southwest.

To reach the spruce, Uncle and Younger Brother first had to pass through the Transition zone, ranging from 7,000 to as high as 9,500 feet, depending upon the aspect of the landscape toward the sun. This is also the land of the ponderosa pine.

On top of Waterless Mountain, Uncle and Younger Brother were in the Canadian zone, where the spruce and fir tree grow. Elevations are slightly higher than the Transition Zone.

b. Picture the tree that Uncle and Younger Brother camped near, the "one lone juniper tree" which "lifted its dark branches above twisted gray rocks."

This tree might be described as short, twisted, and scraggly. Of the thirteen varieties of junipers found in America, this juniper was of the Utah, One-Seed, or Rocky Mountain variety. Junipers, in contrast with piñons, grow on exposed sites. Continual winds keep exposed junipers from growing to their maximum height of twenty-five feet. Junipers secure themselves on the rocks by their tenacious roots. A four-foot-long root that is three inches in diameter can displace fifty tons of soil and rock.

c. Uncle tells Younger Brother how well the cactus plant can remedy skin problems. Think of native tree species that do the same.

The Prickly juniper yields Oil of Cade, an effective treatment for the skin disease, psoriasis. Readers may wish to consult Navajo Ethnobiology for examples of trees and plants used for medicinal purposes. When considering the realm of medical practices note the words of John Adair and Kurt Deutsche, authors of The Peoples Health: Medicine and Anthropology in a Navajo Community, "What is medically relevant is culturally determined."

d. Uncle says to Younger Brother "Let us walk to the north slope and see if there is any snow left under the trees." Consider their likelihood of finding snow.

Picture a mountain's shape in relation to the sun. In the northern hemisphere, the northern slope of all mountains receive less sunlight than the east, west, or south slope. Therefore, the last snow to melt on a mountain is snow on the northern slope of a mountain. Of that snow, the last to melt is snow that lays in the shade of a tree.

e. Uncle cut some spruce boughs and tied them to the pack horse. Then he says "I am glad we came because I need the mountain tobacco and the spruce." He had mentioned spruce at the opening of the chapter. Now he is returning with spruce boughs. Discuss why spruce boughs and why might they be important to Uncle.

Uncle was a medicine man. Undoubtedly, he needed them for an upcoming ceremony. Perhaps he was also returning with tobacco necessary for use in the Night Chant.

2. Obtain a recently cut cross-section of a tree. Using large map pins, mark the annual growth rings and connect by string to a bulletin board indicating important events in a particular year of the tree's growth. Discover how large the tree was when the school was built. Identify differences in sizes and spaces between tree rings. Discuss how drought, lack of light and rainfall affected the tree's growth. Ask students to find rings corresponding to the year of their birth.

3. Bring planting pots and soil for each student. Get seeds or seedlings of a spruce or juniper tree. Plant the seeds and record their growth on graphs. Have class discussions on tree growth.

4. Ask students to collect leaves from nearby trees. If possible, collect fruit and seeds from the tree, also. Place these on a poster and label them.

5. Perform a class experiment. Place a candle in two large resealable glass jars place a candle. Put a small plant in one jar some distance away from the candle. Simultaneously light both candles and seal the jars. Notice which candle stays lit longer. Point out the fact that the presence of oxygen emitted by the plant supplies extra oxygen for the candle.

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"The Gifts of the Trees", an Indian Fable retold by Ann Hudson Downs (July issue of Wee Wisdom), Masinaigan, p. 22.

Many, many moons ago when Man first came to live on the earth, he looked at the vastness that surrounded him and a great loneliness filled his heart. "How shall I live?" he cried. "The world is so big and I am alone!"

The trees were glad the Great Spirit had sent Man to live among them and wanted to help him. "You are not alone. We are your brothers and we will help you," they murmured softly. Man felt comforted.

The maple tree touched him with her tender branches. "I will give you sweet water to drink and to make into sugar," she said.

The hickory tree, shook a host of nuts from his tall branches. "See? I will give you food to satisfy your hunger." "We will help," spoke up the hickory tree's cousin, the chestnut, the beech, and the walnut.

"Then you will need baskets," said Goungah, the elm tree. "Make them with my soft bark and strengthen them with thongs of my tough muscles."

Now there was happiness in the heart of Man as he set out to explore the world, for he had food and drink and friends. But soon a wide river blocked his trail. "Alas, I can go no further!" he cried.

Wigwass, the birch tree grew near the great river and heard his cry. "I will help you, my brother," she called. "Take strips of my skin and tie them together with the tough thongs given to you by the elm tree. Then you will have a canoe strong enough to carry you across the wide rivers."

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Man did as Wigwass suggested and soon the fearful river was behind him. But in the meantime the sun had entered his lodge on the west. Man shivered with cold.

This time it eyed the balsam who saw her brother's need. "Do not suffer cold," she said. "In my heart there is much sunfire. Rub my branches together and they will give you sparks to kindle a flame."

Man followed balsam's instructions and soon a great camp fire roared before him. When he was warm his eyes grew heavy with sleep.

"It's our turn to help," spoke the great pine and the cedar. And they shook a mound of sweet smelling needles beside Man. He spread them into a soft bed and slept.

All through the long night North Wind blew his icy breath over him. But Man rested warm and secure until Wabun, the east wind chased the darkness down the valley and brought the morning to Man's camp fire.

When he awoke there was a great gratitude in this heart. "How can I repay you for your kindness?" he asked the trees.

"We want no pay," they replied. "Giving is the secret of our happiness. We only ask that you use the gifts of the forest wisely. Never waste or destroy what the Great Spirit has given freely to his children."

Indians have never forgotten. They take only what they need and leave the rest for others.

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EVALUATION:

During the conversation following the oral reading, note which students have difficulty grasping answers and be prepared to elaborate as necessary to ensure understanding.

1. Ask students to explain what tree rings are and what their presence indicates.

2. Evaluate student participation on the basis of how accurately students keep track of data in their science notebook. Be sure to prepare students for this evaluation by giving them clear directions and written examples of good lab reports

3. Use removable tree labels so that students can match leaves with tree types. After plenty of practice, have students match leaves with tree names and record correct responses.

4. Judge student achievement according to the degree of enthusiastic participation.

5. Ask, " Why did the candle with the plant nearby burn longer than the another candle?"

RESOURCES:

Adair, John P. and Deutsche, Kurt W. The People's Health: Medicine and Anthropology in a Navajo Community. New York: Appleton-Century-Crofts, 1970

American Forest Council. Project Learning Tree. Washington D.C.: 1988

Armer, Laura Adams. Waterless Mountain. New York: Longmans, Green and Co., 8th ed., 1936.

Beck, Warren A. and Haase, Ynez D. Historical Atlas of New Mexico. Norman, Oklahoma: University of Oklahoma Press, 1969

Preston, Richard J. North American Trees. Ames, Iowa: Iowa State University Press, 5th printing, 1969

DEVELOPED BY:

Clifford W. Thompson, Jr.

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Science

Trees Help Us Breathe

Objective:

Students will learn the importance of trees in our environment.

Exploration:

Ask the students the following questions: Why do we need trees? What do they do for us? What would it be like with no trees around us?

The reference table may contain numerous books about trees, including:

Silverstein, Shel. *The Giving Tree.* New York: Harper & Row, 1964.

Busch, Phyllis S. *Once There Was A Tree.* New York: Dial Books, 1985.

Hutchins, Ross E. *This Is A Tree.* New York: Meal Dodd, 1964.

Guilcher, Jean M., & Noailles, R. H. *A Tree is Born.* New York: Stirling Publishing, 1960.

Udry, Janice May. *A Tree Is Nice.* New York: Harper, 1956.

Podendorf, Illa. *The True Book Of Trees.* New York: Grosset & Dunlap, 1960.

Seminar:

Discuss: What did you find out about trees? What do they do for us? What would it be like around us with no trees?

Invention:

Imagine yourself as an early settler along the eastern seaboard. Just getting through the trees was hard work! As people worked their way westward, getting rid of trees was a major problem. Trees were in the way; they had to be cut down to clear land for agriculture, building and travel.

When the westward movement reached the Great Plains, the land ran out of trees. Now there were only grasses as far west as the eye could see. There were no tree clearing problems; the land was ready for the plow. But settlers were immediately faced with a new problem. There was no lumber for buildings or fuel wood for heating and cooking. Unless they hauled logs and fuel wood from the eastern forest, settlers had to cut sod for homes and livestock shelters. Buffalo and cattle dung (solid waste) was used for cooking fires and heating.

It wasn't long before the settlers realized that the treeless prairies gave no protection from the cold winter winds and snowstorms and no shade during the hot summer months. To get this protection and shade, the settlers began to plant trees around their farm buildings and feedlots.

Trees do more than spruce up our space and provide wind shelter! They serve humans in many beautiful, practical and important ways.

Trees supply the oxygen we need to breathe. Trees make their food through photosynthesis; carbon dioxide and water are combined with sunlight energy to make sugars (tree food) and oxygen. Trees use the carbon dioxide that we exhale to make food. In return, they give off oxygen for us to breathe. Enough oxygen is produced by a single acre (about the size of a football field) of young growing trees to supply the needs of 18 human beings each year.

Trees help our environment. They clean the air by trapping much of the dust, dirt and grit that pollute the air and fall on us. They keep our air supply fresh by absorbing the carbon dioxide that we exhale and that is given off by factories and engines. They are great privacy and sound barriers. They refresh our watersheds, cool the air and shelter us from direct sunlight on hot, sunny days.

Trees help save energy costs. A single row of tall evergreens planted on the northwest side of a home can cut fuel bills up to twenty percent. On hot summer days trees are natural air conditioners; they lower air temperatures by evaporating water in their leaves. Shade trees planted near homes can lower the indoor temperature considerably.

Application:

Each student will receive a 9" x 12" piece of construction paper. You will create an aerial view of your ideal yard. Place your trees where they will help save energy costs. Create symbols or just label each part. Here is an example of "aerial view":

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Science

Where Have All the Forests Gone?

Objective:

Students will define deforestation, identify the main causes of deforestation, and learn how deforestation affects the environment.

Materials:

- cake pans
- soil
- small rocks
- sand
- bean seeds
- grass seed
- plant sprinkler or pitcher

Exploration:

Group students and pass out the cake pans. Have the students put a layer of small rocks or pebbles on the bottom of the pan for drainage. Do not put anything at one end of the pan. Next, layer a thick mixture of sand and soil into the pans on one side, slanted downwards to one end that should remain empty. Poke holes about one-half inch from the surface of soil. Place one bean seed in each hole. Cover lightly with soil. Sprinkle grass seed over the surface of the soil. Water lightly and place in sunshine. Allow seeds time to grow.

Seminar:

After seeds have time to grow a few inches, separate the pans into two groups. With one group of pans, cut the bean sprouts close to the soil. Remove the cuttings. The other pans of sprouts are left uncut. From a height of about 12 inches, pour water onto the topsoil.

Suggested Questions:

Describe what is happening?
Is the soil running to the empty end?
How much soil has been washed away by the rain?
What is the difference between the pan with cut "trees" and the pan with uncut "trees?"

Students may record the results in their science journals.

Invention:

Explain that the pans and bean sprouts model a simulation of our real environment. The bean sprouts represent the trees. Trees anchor and protect the soil. **Deforestation** occurs when trees are cleared from an area. If all of the trees in a given area are cut down, called **clear-cutting**, there is nothing left to protect the soil from rain or wind, until new trees have grown back. This is one form of deforestation. Another form of deforestation may be caused by **forest fires**.

Exploration:

Remove the top layer of grass in the pans with the cut sprouts, so that the soil is exposed (simulated after effects of clear cutting or forest fire). Now pour water onto the soil from a height of about 12 inches.

Seminar:

Discuss the differences in the two experiments (with "trees" or without "trees" *and* with grass or without grass).

1. What is happening now?
2. How much soil has run off onto the empty end of the pan?
3. Is it more than the first experiment? Less soil than the first experiment?
4. Which loses more soil, the pan with "trees and grass" or the pan without?
5. Can you plant crops here? Why or why not?

Invention:

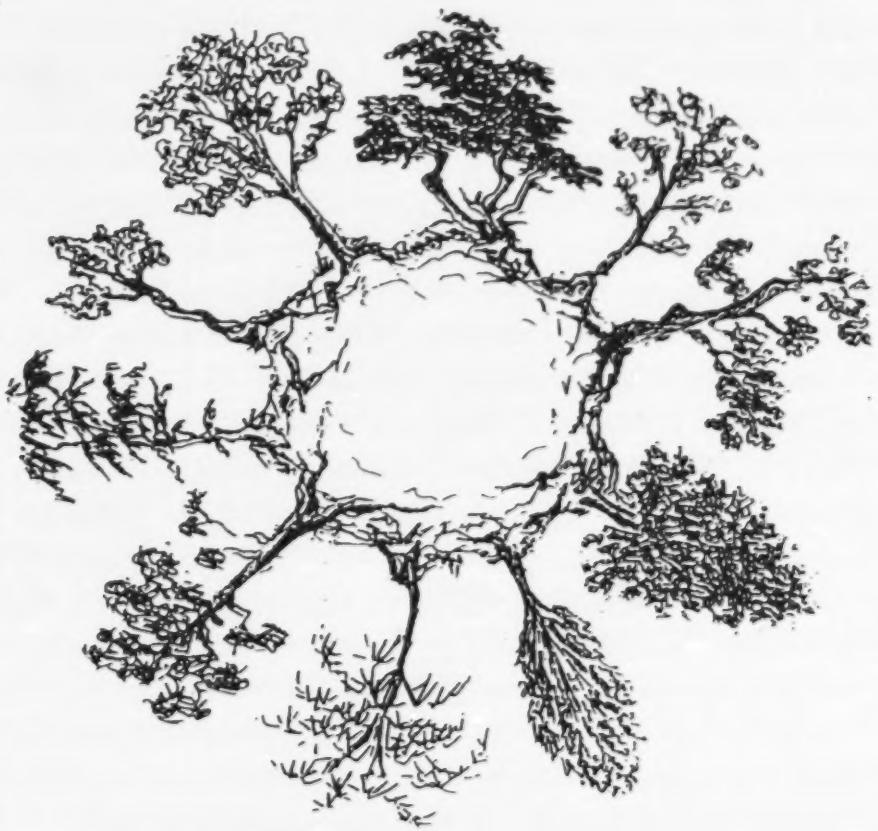
Whether the deforestation is caused by cutting or by forest fires, erosion is usually the result. **Erosion** is the process by which soil or rocks are worn or carried away by water, wind, or gravity.

The second experiment was a simulation of erosion. When the trees were taken away, the grass was exposed and it started dying as a result of the heat from the sun. When the rains came, the top soil was washed away. Once the topsoil is gone, trees or planted crops will not grow as well.

Application:

Reforestation is the opposite of deforestation.

1. In cooperative teams, design reforestation plans for an area that has been clear cut.
2. Make a plan to harvest trees in a way that reduces erosion.
3. Discuss/debate the effects of deforestation on all types of forests (including tropical rain forests).



SCIENCE STANDARDS AND BENCHMARKS FOR INTERMEDIATE GRADES ADDRESSED IN INDIANS' USE OF TREES UNIT –

Standard – Understands the convictions scientists share about the nature of the world and what can be learned about it
Benchmarks –
Understands that the same scientific investigation often gives slightly different results when it is carried out by different persons, or at different times or places; however, if the results of repeated experiments are very different, something must be wrong with the design of the investigation
Understands that scientists often repeat an experiment many times before accepting a consistent result as true

Standard – Understands that scientific inquiry works in particular ways
Benchmarks –
Understands the many forms scientific investigation can take: naturalistic observation of things or events, data collection, and controlled experiments; and the kinds of questions it attempts to answer: physical, biological and social
Understands that scientists can have different explanations for the same set of observations, but all scientists expect explanations to be logical arguments backed up by evidence

Standard – Understands the main individual, social, ethical and institutional aspects of science
Benchmarks –
Understands that written communication is an essential part of doing science
Understands that doing science involves many different kinds of work and many different kinds of people

Standard – Understands the processes that shape the surface of the earth and the relation of the surface of the earth to the living environment
Benchmarks –
Knows that waves, wind, water, and ice change the earth's surface to produce many of the landforms, such as shorelines, cliffs, deserts and valleys (wind and water can move soil, depositing it downstream in seasonal layers)
Knows that soil is made partly from weathered rock and partly from products of plants and animals

Standard – Knows about the diversity and unity that characterize life
Benchmarks –
Knows that living things can be sorted into groups in many ways using various properties to decide which things belong to which group
Knows that plants and animals are alive and go through predictable life cycles, which include growth, development, reproduction and death

Standard – Understands how species depend on one another and on the environment for survival
Benchmarks –
Knows that plants and animal species depend on each other to maintain life, e.g., many plants depend on animals for carrying their pollen to other plants or dispersing their seeds

Standard – Understands the cycling of matter and flow of energy through the living environment
Benchmarks –
Knows that all animals' food can be traced back to plants
Knows that some source of "energy" is needed for any work to be done; for example, food is the fuel and the building material for all organisms

Standard – Understands the basic concepts of the evolution of species
Benchmarks –
Knows that living things of the same kind vary among individuals, and sometimes the differences give individuals an important advantage in surviving and reproduction
Knows that cultivated plants result from selective breeding for particular traits
Knows that fossils provide evidence that some organisms living long ago are now extinct, and can be compared to one another and to living organisms according to their similarities and differences

Standard – Knows about patterns of change and constancy
Benchmarks –
Knows that things change in steady, repetitive, or irregular ways, or sometimes in more than one way at the same time, and that a table or graph of observations or measurements often is the best way to tell which kinds of change are happening
Knows that a system may stay the same because nothing is happening to it or because the things happening to it exactly counterbalance one another

AMERICAN INDIAN STANDARDS FOR INTERMEDIATE GRADES ADDRESSED IN INDIANS' USE OF TREES UNIT –

Science as Inquiry –
Indian students should develop the ability to articulate examples of the scientific inquiry necessary to develop and improve technologies employed by early American Indians, such as arched roof structures.

Life Science –
Indian students should develop an understanding of concepts of nature's diversity, codependency and the intricate balance between natural forces and how they are reflected in traditional Indian philosophies and symbols, such as the Medicine Wheel.

Science and Technology –
Indian students should develop an understanding of the technological design process and how it was applied in the development of various tools and technologies employed by early American Indians, such as fish weirs, salmon spearing platforms, and building construction technologies.

Indian students should develop an understanding of the benefits and constraints of technological design through an examination of the building materials used in traditional American Indian housing (e.g., Northwest Coast planks).

Science in Personal and Social Perspectives –
Indian students should develop an understanding of how environmental degradation may be occurring in their communities and/or reservation lands.

History and Nature of Science –
Indian students should develop an understanding of ways in which reasoning, insight, energy, skill and creativity were demonstrated in the scientific achievements of early American Indians – architecture, tools, health and medicine.

Indian students should develop an understanding of examples of Indian men and women with diverse interests, talents, qualities, and motivations who currently engage in the activities of science, engineering and related fields.

• Background • Materials • Activities • Standards • for Social Studies/History-Based Units

HISTORY/SOCIAL STUDIES

Teacher's/Parent's Background Information –

It is very important that our children know who they are. The units on history/social studies will help Indian children understand their backgrounds and realize their rich cultures and uniqueness. NonIndian children will learn to appreciate Indian people.

Many states require that information on Indian history/culture of the tribes in that state be taught sometime in the intermediate grades. For this purpose, the materials focusing on the various tribes for the first unit will be helpful. They should be coupled with other available resources - written, audio-visual and human – to verify information and to provide for a complete study of the state's tribes, with emphasis on the local tribe(s).

The study of general Indian history can be taught at one or both of the other grades. Or perhaps students can learn about their own tribe one year, about the other tribes in the state another year, and general Indian history by itself or woven in with regular history a third year, or some other variation. In any case, it is recommended that the teacher utilize the following resources for the teaching of general Indian history:

Indian Country: A History of Native People in America by Karen D. Harvey and Lisa D. Harjo (**Indian Author**), North American Press, 1994.

A Time for Native Americans: Four Biographical Card Games available from Four Winds Books, York, NE.

Map of American Indian Tribes or Map of North American Indians available from Four Winds Books, York, NE.

ACTIVITIES FOR THE UNITS -

1. Engage students every way possible. "Read the chapter and we'll discuss it" is not a good way to teach. Neither is lecturing all the time. Chapters can be read aloud together, or parts of chapters – a chapter does not have to be read at one time. Students can be assigned to be responsible for reporting on various parts of a chapter or on various books. Books, chapters or parts of chapters can be read after discussion or other activities rather than only before.

2. Instruction should include field trips, guest speakers, projects, audio-visual aids, higher order thinking questions such as "What would you do if..?"

3. Students can be provided questions for which they are to find answers by using various resources and then give presentations with visuals indicating their findings.

HISTORY/LIVES OF TRIBAL GROUPS

The following are to be used in a study of the tribes of the state and/or the local tribe(s).

Books by Virginia Driving Hawk Sneve (**Indian Author**), on various tribes, Holiday House. Title include The **Iroquois**, The **Navajos**, The **Nez Perce**, The **Seminoles**, The **Sioux**, The **Hopi,** The **Cheyennes,** The **Apaches,** and The **Cherokees**.

American Indians Junior Series, Chelsea House includes, **Apache** Indians, **Arapaho** Indians, **Blackfeet** Indians, **Cherokee** Indians, **Cheyenne** Indians, **Chumash** Indians, **Comanche** Indians, **Creek** Indians, **Crow** Indians, **Hopi** Indians, **Huron** Indians, **Iroquois** Indians, **Kiowa** Indians, **Kwakiutl** Indians, **Lenape** Indians, **Mohawk** Indians, **Navajo** Indians, **Nez Perce** Indians, **Powhatan** Indians, **Pueblo** Indians, **Sac & Fox** Indians, **Santee Sioux** Indians, **Seminole** Indians, **Shawnee** Indians, **Shoshone** Indians, and **Teton Sioux** Indians.

Indian Nations Series, Raintree (**Includes Indian Authors**) includes The **Cheyennes**, **Cherokee**, The **Dakota Sioux,** The **Menominee, Makah.**

Indians of the Americas Series includes The **Abenaki**, The **Chilula**, The **Ottawa**, The **Tohono O'odham**, The **Potawatomi**, The **Algonquians**, The **Chippewa**, The **Pawnee**, The **Pueblos**, The **Wampanoag**, The **Cheyenne**, The **Creek**, The **Penobscot**, The **Seminoles**, The **Zuni**, The **Iroquois**, The **Pomo**, and The **Shawnee**.

New True Books About Native Americans Series, Children's Press, includes The **Apache**, The **Cherokee**, The **Cheyenne**, The **Chippewa**, The **Choctaw**, The **Chumash**, The **Crow**, The **Delaware**, The **Eskimo**, The **Hopi**, The **Mandans**, The **Menominee**, The **Mohawk**, The **Navajo**, The **Nez Perce**, The **Oneida**, The **Onondaga**, The **Pawnee,** The **Penobscot**, The **Pomo**, the **Seminole**, The **Seneca**, The **Shoshoni,** The **Sioux**, The **Tlingit**, The **Tuscarora**.

Lifeways Series on American Indian tribes.

First Books Series on American Indian tribes.

First Americans Series by Facts on File includes **California** Indians, Indians of the **Plains**, Indians of the **Arctic and Subarctic**, Indians of the **Plateau and the Great Basin**, Indians of the **Northeast**, Indians of the **Southeast,** Indians of the **Pacific Northwest** and Indians of the **Southwest**.

The **Choctaw** Nation by Allison Lassieur, 2001.

O Wakaga: Activities for Learning about the **Plains** Indians by Linda Skinner Brewer (**Indian Author**), Daybreak Star Press, 1984.

The Mamook Book by Linda Skinner, Terry Tafoya and Sharon Mathews (**Indian Authors**), Daybreak Star Press, 1979.

Navajo History by Ethelou Yazzie (**Indian Author**), Rough Rock, 1971.

Indians of Northwest **California**: History/Social Science and Literature Based Curriculum Units by Sarah Supahan, Klamath-Trinity Joint Unified School Dist, 1992.

Tohono O'odham: Lives of the Desert People, Tohono O'odham Tribal Council, Tohono O'odham Education Department, 1989.

People of Salmon and Cedar by Ron Hirschi, Cobblehill. **Northwest**

The **Wampanoags** of Mashpee by Russell Peters (**Indian Author**), Indian Spiritual and Cultural Training Council, 1987.

Migration of the **Iroquois** by Ray Fadden, Tehanetorens (**Indian Author**), White Roots of Peace, 1972.

The **Zunis** by K and D. Doherty, Franklin Watts, 1993.

The Wabanakis of Maine and the Maritimes: A Resource Book about **Penobscot**, **Passamaquoddy**, **Matiseet**, **Micmac** and **Abenaki** Indians, AFSC, 1989.

The Mishomis Book: The Voice of the **Ojibway** by Edward Benton Benai (**Indian Author**), Red School House, 1979.

People of the Buffalo: How the **Plains** Indians Lived by Maria Campbell (**Indian Author**), Douglas & McIntyre, 1976.

Riel's People: How the **Metis** Lived by Maria Campbell (**Indian Author**), Douglas & McIntyre, 1978.

We Are **Mesquakie**: We Are One by H. Irwin, Feminist Press, 1980.

The **Yaqui**: A People and Their Place by F. S. Molina, Arizona Humanities Council.

BEFORE 1492

50,000 B.C. Archeologists believe that this is when people begin to cross the Bering Strait land bridge and dispersed throughout North and South America. But Indian people, in general, and others don't believe this theory. Indian people believe they have always been in the Americas, and nonIndians keep discovering evidence that may refute the Bering Strait theory. Indian people have their own creation stories.

1000 B.C. – 200 A.D.
Adena Mound Building culture in and near the Ohio Valley

300 B.C. – 700 A.D.
Hopewell Mound Building culture in the East

300 B.C. – 1000 A.D.
Mogollon culture in the Southwest

100 B.C. – 1500 A.D.
Hohokam culture in the Southwest

100B.C. – 1300 A.D.
Anasazi culture in the Southwest

700-1700 A.D.
Mississippian Mound Building culture in Southeast

985-1014 A.D.
Eric the Red and Leif Ericson establish settlements in Greenland and North America

LITERATURE FOR UNIT -

Prehistoric Peoples, American Indians Juniors Series, Chelsea House.

The Earliest Americans by Helen Roney Sattler, Clarion, 1993.

Clash of Cultures: Prehistory-1638 by Christopher Collier, 1998.

Mounds of Earth and Shell: Native Sites, the Southeast by Bonnie Shemie, 1994.

Ancient Indians of the **Southwest** by Alfred Tamarin and Shirley Glubok, Doubleday.

The Secret Story of Pueblo Benito by M. Elting and M. Folsom, Scholastic, 1963.

I Can Be An Archaeologist by R. B. Pickering, Children's Press, 1987.

The Ancient Cliff Dwellers of Mesa Verde by Caroline Arnold, Clarion, 1992.

Mesa Verde/National Park by Ruth Shaw Ladlauer.

Native Americans and Mesa Verde by Hazel Martell, 1993.

Canyon de Chelly: The Story of Its Ruins and People by Z.A. Bradley, National Park Service, 1973.

Cities in the Sand: The Ancient Civilizations of the Southwest by S. Warren, Chronicle Books, 1992.

The Anasazi by Eleanor Ayer, 1992.

Before Columbus by M. Batherman, Houghton Mifflin, 1981.

Dog People by Joseph Bruchac **(Indian Author)**.
A series of stories set in northern New England in ancient times. **Abenaki**

1492 AND THE 1500's

1492	Columbus – 5 million Indian people in North America, excluding Mexico.
1513	Juan Ponce de Leon of Spain sailed to Florida.
1528-1536	The Panfilo de Narvaez Expedition of Spain through the Southeast and Southwest
1532-1541	Frenchmen explore the Atlantic Coast and the St. Lawrence River system.
1539-1542	Spanish explore the Southwest, Southeast and Pacific Coast.
1560-1570	The Iroquois League consisting of the Mohawk, Oneida, Onondaga, Cayuga, and Seneca tribes formed by Deganawida and Hiawatha.
1562-1565	The French establish colonies in South Carolina and Florida but are driven out by the Spanish.
1565	The Spanish establish St. Augustine in Florida, the first permanent European settlement in North America.
1568	The Catholic Church starts the first missionary Indian school in Havana for Indian children brought from Florida.
1576-1579	Englishmen explore the Northwest and the California Coast.
1585-1590	Englishman Sir Walter Raleigh established two colonies on Roanoke Island, North Carolina. Both of them failed.
1586	A potato crop was taken to England.
1598	Spaniard Juan de Onate founded colony in New Mexico. Today it is San Juan Pueblo.
1598-1599	Indians of Acoma Pueblo in New Mexico attack Spanish. Juan de Onate and forces kill eight hundred Indians.

LITERATURE FOR UNIT -

Morning Girl by Michael Dorris **(Indian Author)**, Hyperion.
About the lives of a 12 year old girl and her brother on a Bahamian island in 1492.

A Coyote Columbus Story by T. King **(Indian Author)**, Groundwood, 1992.

Rethinking Columbus: Teaching about the 500th Anniversary of columbu

Sees Behind Trees by Michael Dorris **(Indian Author)**, Hyperion.
About a nearsighted **Powhatan** boy in fifteenth century America.

Children of the Longhouse by Joseph Bruchac **(Indian Author)**, Dial.
A novel set in a **Mohawk** village of the late 1400's.

Neekna and Chemai by Jeanette Armstrong **(Indian Author)**, Theytus Books.
The story of two little girls growing up before the coming of the white man.

Clash of Cultures: Prehistory –1638 by Christopher Collier, 1998.

Hiawatha – Founder of the **Iroquois** Confederacy, North American Indians of Achievement Series.

Hiawatha: Messenger of Peace by D.B. Fradin, McElderry Books, 1992.

Hiawatha and the **Iroquois** League by M. McClard, Silver Burdett, 1989.

The Amazing Potato by Milton Meltzer.

Aztec Indians, American Indians Juniors Series, Chelsea House.

Pueblo Indians, American Indians Junior Series, Chelsea House.

The **Pueblos**, Indians of the Americas Series.

THE 1600's AND 1700's

1600	Sheep were brought to the Southwest by the Spanish.
1600-1770	The use of the horse by Indian people spread from Mexico into the Southwest and into the Great Plains.
1607	The English established their first permanent settlement at Jamestown, VA under John Smith.
1609-1613	John Smith captured by Indians. Story that Pocahontas, Powhatan's daughter, interceded on Smith's behalf. Pocahontas is captured by the settlers, marries John Rolfe, travels to England where she dies.
1615	Frenchman Samuel de Champlain attacks Onondaga villages with Huron war party and turns Iroquois League against the French.
1620	The Pilgrims arrive at Plymouth. Squanto had been kidnapped and taken to England earlier and teaches them how to plant corn.
1621	With Squanto acting as interpreter, the Pilgrims make a pact of peace with the Wampanoags and celebrate the first Thanksgiving.
1622	The Powhatan confederacy of 32 tribes under Opechancanough attacked Settlers at Jamestown.
1626	The Canarsee Indians sell Manhattan Island to Peter Minuit, governor of New Netherlands for sixty guilders worth of trade goods.
1627	The Company of New France is chartered to colonize and develop fur trade with the Indians.
1638	Pequot War in New England claims the lives of 600 Indian men, women and children.
1661	The Spanish raid the sacred kivas of the Pueblo people to detroy their culture and religion.
1675-1676	King Phillip, Wampanoag, wages war against the colonies and several other tribes that joined forces with the colonists.
1680	Pueblo Indians revolt against Spanish rule. Spanish return in 1689.
1689-1697	French and Indian War. The Iroquois sided with the English and Algonquin nations with the French.

1703-04	Queen Anne's War between England and France in the Northeast and England and Spain in the South.
1744-1748	King George's War between French and English divides the Indian tribes.
1751	Benjamin Franklin sites Iroquois League as a model for his plan for government.
1755	Iroquois League sides with the British against the French.
1760	War between the colonists and the Cherokee
1761	The Aleuts of Alaska revolt against the Russians.
1763-1764	Chief Pontiac rebels against the English in the Great Lakes region.
1769	California is claimed for Spain and missions were established.
1775-1783	The American Revolution. Declaration of Independence signed in 1776.
1778	The first U.S.- Indian treaty is signed between the U.S. and the Delaware.
1778	The Iroquois, under Joseph Brant, and British regulars attack American Settlers in New York and Pennsylvania.
1779	A counteroffensive against the Iroquois breaks the power of the League.
1781-1789	The Articles of Confederation include the principle that the central Government should regulate Indian affairs and trade.
1784	The Congress orders the War Office to provide troops to assist the Commissioners in their negotiations with the Indians.
1787	The Northwest Ordinance calls for Indian rights, the establishment of reservations and the sanctity of tribal lands.
1789	Congress establishes a Department of War and grants the Secretary of War authority over Indian affairs.
1787-1789	The Constitution contains the power to regulate commerce with foreign nations, among the states, and with Indian tribes.
1794	The Battle of Fallen Timbers takes place. Miami and Shawnee defeated.

LITERATURE FOR UNIT –

Clash of Cultures: Prehistory – 1638 by Christopher Collier, 1998.

Pocahontas – **Powhatan** Peacemaker, North American Indians of Achievement Series.

Squanto's Journey: The Story of the First Thanksgiving by Joseph Bruchac (**Indian Author**), Harcourt. **Wampanoag**

Guests by Michael Dorris (**Indian Author**), Hyperion.
Thanksgiving as it might have appeared to a Native American boy.

Thanksgiving: A Native Perspective by Doris Seale, Carolyn Silverman (**Indian Authors**) and Beverly Slapin, Oyate, 1996.

Tapenum's Day: A **Wampanoag** Indian boy in Pilgrim Times by Kate Waters, Scholastic, 1996.

King Phillip – **Wampanoag** Rebel, North American Indians of Achievement Series.

King Phillip and the War with the Colonists by R. Cwiklik, Silver Burdett Press, 1989.

Pontiac – **Ottawa** Rebel, North American Indians of Achievement Series.

Joseph Brant – **Mohawk** Chief, North American Indians of Achievement Series.

The **Iroquois** by Virginia Driving Hawk Sneve (**Indian Author**), Holiday House.

Iroquois Indians, American Indians Junior Series, Chelsea House.

The **Iroquois**, Indians of the Americas Series.

A Mission for the People: The Story of Purisima by Mary Ann Fraser, Henry Holt, 1998.

A Time of Resistance: **California** Indians During the Mission Period, 1769-1848,by Sarah Supahan, Klamath-Trinity Joint Unified School District, 1992.

The Arrow over the Door by Joseph Bruchac (**Indian Author**). **Abenaki**
In 1777, a group of Quakers and a party of Indians have a memorable meeting.

From the Ashes by Pat Ramsey Beckman, Council for Indian Education. **Shawnee**

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Great Native Americans by Peter Copeland.

1800 TO 1868

1802	Congress appropriated funds to "civilize and educate" Indian people.
1803	The Louisiana Purchase adds a large Indian population to the U.S.
1803-1806	Lewis and Clark expeditions open up the West.
1809-1811	Tecumseh, a Shawnee chief, tries to unite tribes against the U.S.
1809-1821	Sequoyah creates the Cherokee alphabet. In 1830, the Cherokees started their own educational system using the alphabet.
1812-1815	The War of 1812 between the U.S. and England. Tecumseh is killed.
1813-1818	Andrew Jackson takes Creek lands, invades Florida to punish Seminoles.
1830	The Indian Removal Act calls for relocation of eastern Indians to Indian Territory west of the Mississippi River.
1831-1839	Five Civilized Tribes of the Southeast relocated to Indian Territory.
1832	The Bureau of Indian Affairs is organized as part of the War Department.
1845-1853	The Spanish Southwest and its many Indian tribes become part of U.S.
1848-1849	Gold discovered in California, destruction of California and Plains Indians.
1849	Bureau of Indian Affairs is transferred to the Dept. of Interior.
1851	The Treaty of Ft. Laramie between the U.S. and Northern Plains tribes.
1853-1856	U.S. acquires 174 million acres through 52 treaties, all broken by whites.
1858-1859	Gold is discovered in Colorado.
1864	The Navajo people are forced on the "Long Walk" to Bosque Redondo.
1864	Three hundred Cheyenne and Arapaho killed at Sand Creek Massacre.
1865	Government gives contracts with missionaries to start Indian schools.
1866-1868	War for the Bozeman Trail includes Sioux, Cheyenne and Arapaho under Red Cloud. Second Ft. Laramie Treaty.

LITERATURE FOR UNIT –

Story of the Lewis & Clark Expedition, Cornerstones for Freedom, Children's Press.

Sacagawea – Westward with Lewis & Clark, North American Indians of Achievement Series.

Sacajawea, Guide to Lewis and Clark by Della Rowland.

Osceola – **Seminole** Rebel, North American Indians of Achievement Series.

Osceola: Patriot and Warrior by M. Jumper, Raintree Steck Vaughn, 1993.

Osceola: **Seminole** Warrior by W. R. Sanford, Enslow Pub., 1994.

John Hawk, A **Seminole** Saga by Beatrice Levin, Council for Indian Education.
John White becomes involved with Osceola in the fight to save their land in the early 1800's.

Tecumseh – **Shawnee** Rebel, North American Indians of Achievement Series.

Tecumseh and the Dream of An American Indian nation by R. Shorto, Silver Burdett Press, 1989.

Sequoyah – Inventor of the **Cherokee** Alphabet, North American Indians of Achievement Series.

Sequoyah and the **Cherokee** Alphabet by R. Dwiklik, Silver Burdett, 1989.

Sequoyah's Gift: A Portrait of the **Cherokee** Leader by J. Klausner, Harper Collins, 1993.

Longwalker's Journey: A Novel of the **Choctaw** Trail of Tears by Beatrice Orcutt Harrell **(Indian Author)**, Dial, 1999.

Rising Fawn and the Fire Mystery by Marilou Awiakta **(Indian Author)**, Iris, 1983. The story of a young **Choctaw** girl during the Trail of Tears.

The Trail of Tears by Joseph Bruchac **(Indian Author)**, Random House. **Cherokee**

Story of the Trail of Tears, Cornerstones of Freedom, Children's Press.

Birchbark House by Louise Erdrich **(Indian Author)**, Hyperion.
The story of a young **Ojibwa** girl in 1847.

Horse Raid: An **Arapaho** Camp in the 1800's by Susan Korman, Smithsonian Institution, 1998.

The Glorious Quest of Chief Washakie by Ralph and Mary Tillman. **Shoshone**

Navajo Long Walk by N.M. Armstrong, Roberts Rhinehart Pub., 1994.

Sing Down the Moon by Scott O'Dell. **Navajo**

Brave Eagle's Account of the Fetterman Fight by Paul Goble. **Lakota**

Death of the Iron Horse by Paul Goble. **Cheyenne**
August 7, 1867 an "Iron Horse" was derailed by Indians.

Daily Life in a Plains Indian Village, 1868 by Michael Bad Hand Terry, 1999. **Cheyenne**

Red Cloud – **Sioux** War Chief, North American Indians of Achievement Series.

Red Cloud by Ed McGaa (**Indian Author**), Dillon, 1977. **Lakota**

Red Cloud: Sioux Warrior by W. R. Sanford, Enslow Pub., 1994.

Red Wing and Shakopee in They Led a Nation by Virginia Driving Hawk Sneve (**Indian Author**), Brevet Press, 1975. **Dakota**

Cochise - **Apache** Chief, North American Indians of Achievement Series.

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Native American Leaders by Janet Hubbard-Brown.

Great Native Americans by Peter Copeland.

1869 TO 1899

1868-1869	Southern Plains War involves Cheyennes, Sioux, Arapahos, Kiowas and Comanches.
1869	President Grant's Peace Policy instituted. Lasts until1871.
1869	Ely Parker (Seneca) becomes first Indian Commissioner of Indian Affairs.
1869	Transcontinental railroad is completed, joined at Promontory Point, UT.
1871	Congress passes law forbidding further treaties with Indian tribes.
1871	Western Indians not to leave reservations without permission of agents.
1871	White hunters begin wholesale killing of buffalo.
1874	Gold discovered in the Black Hills of South Dakota. Miners ignore treaties.
1876-1877	Sioux War for the Black Hills under Sitting Bull and Crazy Horse.
1876	Battle of the Little Bighorn. Custer defeated.
1877	Nez Perce under Chief Joseph take flight.
1878	Congress provides for Indian police.
1879	Richard Pratt starts Carlisle Indian School in Pennsylvania to assimilate Indians. Start of government boarding schools.
1881	Sitting Bull and his band surrender at Ft. Buford, North Dakota.
1881-1886	Apache resistance under Geronimo in the Southwest.
1885	The last great herd of buffalo is exterminated.
1887	Congress passed the Allotment Act (Dawes Act) and gave individual Indians parcels of land and opened up surplus to whites.
1890	The Ghost Dance Movement led by Wovoka (Paiute) gains influence. The Wounded Knee massacre in South Dakota.
1890-1910	The population of Indians fell to a low point of less than 250,000 in U.S.

LITERATURE FOR UNIT –

Quannah Parker: **Comanche** Warrior by W. R. Sanford, Enslow Pub., 1994.

Quannah Parker – **Comanche** Chief, North American Indians of Achievement Series.

Where the Broken Heart Still Beats by Carolyn Meyer. **Comanche**
Story of mother of Quannah Parker.

Riel's Saskatchewan Rebellion by F. W. Anderson, 1987.

Louis Riel by R. Neering, Fitzhenry & Whiteside, 1992.

War of the Mormon Cow: Crazy Horse Chronicles by Richard Jepperson.

They Led a Nation by Virginia Driving Hawk Sneve (**Indian Author**), Brevet, 1975.
Biographies of 20 **Sioux** leaders.

Chief Gall – **Sioux** War Chief, North American Indians of Achievement Series.

Sitting Bull – **Sioux** Leader, North American Indians of Achievement Series.

A Boy Called Slow by Joseph Bruchac (**Indian Author**). **Lakota**

Sitting Bull by Herman Viola, American Indian Stories Series, Raintree.

Crazy Horse – **Sioux** War Chief, North American Indians of Achievement Series.

Crazy Horse's Vision by Joseph Bruchac (**Indian Author**). **Lakota**

The Life and Death of Crazy Horse by R. Freedman, Holiday House, 1996.

Story of the Little Big Horn, Cornerstones of Freedom, Children's Press

Red Hawk's Account of Custer's Last Battle by Paul Goble. **Lakota**

Keeper of Fire, Council for Indian Education.
A young survivor of the Custer Battle faces great danger and hardship.

Sitting Bull and the Battle of the Little Bighorn by S. Black, Silver Burdett Press, 1989.

Chief Joseph – **Nez Perce** Leader, North American Indians of Achievement Series.

Chief Joseph: **Nez Perce** Warrior by W. R. Sanford, Enslow Pub., 1994.

Indian School: Teaching the White Man's Way by Michael Cooper, Houghton Mifflin, 1999.

Cheyenne Again by Eve Bunting, Clarion, 1995.

The Middle Five: Indian School Boys of the **Omaha** by Francis LaFlesche (**Indian Author**).

Geronimo and the Struggle for **Apache** Freedom by Russell Shorto, Alvin Josephy's Biography Series of American Indians, 1990.

Geronimo – **Apache** Warrior, North American Indians of Achievement Series.

Geronimo by David Jeffery, American Indian Stories Series, Raintree.

Spirit of the White Bison by Beatrice Culleton (Indian Author), Book Pub. Co., 1985.

Sarah Winnemucca – Northern **Paiute** Writer and Diplomat, North American Indians of Achievement Series.

Sara Winnemucca by Mary Francis Morrow, American Indian Stories Series, Raintree.

Susette LaFlesche by Marion Marsh Brown. **Omaha**
She worked extensively for the Indian cause.

The Ghost Dance by Alice McLerran. **Lakota**

A Boy Becomes a Man at Wounded Knee by Ted Wood with Wambli Numpa Afraid of Hawk (**Indian Author**), Walker & Co., 1992. **Lakota**

Story of Wounded Knee, Cornerstones of Freedom, Children's Press.

Doesn't Fall Off His Horse by Virginia Stroud (**Indian Author**), Dial. **Kiowa**
The life of a Kiowa boy at the end of the 19th century.

Goodbird, the Indian by Edward Goodbird. **Hidatsa**

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Native American Leaders by Janet Hubbard-Brown.

Great Native Americans by Peter Copeland.

Children of the Circle: A Photographic History of Native American Children from 1880 to 1920 by Adolph and Star Hungry Wolf (**Indian Authors**).

1900 TO 1952

1902	The Reclamation Act encourages settlement of the West.
1906	The federal government seized 50,000 acres of wilderness land including the sacred Blue Lake of the Taos Pueblo.
1909	Teddy Roosevelt issues executive order transferring 2.5 million acres of Indian timber lands to national forests.
1910	U.S. government forbids the Sun Dance among Plains Indians.
1911	The Society of American Indians was formed as an activist group.
1914-1918	Many Indian people enlisted in the armed forces during WWI.
1917-1920	Many Indians lost their lands to corrupt Anglos.
1921	The Dept. of Interior responsible for Indian education and social services.
1924	Congress awarded American citizenship to all Indians. Some had already obtained it.
1928	Charles Curtis, Kaw Indian and U.S. Senator, was elected vice-president under Hoover.
1928	The Merriam Report deplored Indian living conditions and declared the allotment system a failure.
1934	The Wheeler-Howard Act provides for tribal ownership of land and tribal self-government.
1941-1945	Twenty-five thousand Indians served in active duty during WWII. The code talkers used their language as a code the enemy couldn't decipher.
1944	The National Congress of American Indians was organized.
1946	An Indian Claims Commission was created to settle tribal land claims against the U.S.
1949	The Hoover Commission recommended termination of the federal-Indian trust relationship.
1952	BIA program for voluntary relocation of Indians to urban areas for work.

LITERATURE FOR UNIT –

Ishi, Last of His Tribe by Theodora Kroeber. **California**

Ishi, Last of His People by David Peterson. **California**

Ishi by Louise V. Jeffredo-Warden, American Indian Stories Series, Raintree.

The **Taos** Indians and Their Sacred Blue Lake by Marcia Keegan, Messner, 1972.

Carlos Montezuma by Peter Iverson, American Indian Stories Series, Raintree. **Yavapai**

Flight of the Red Bird: The Life of Zitkala-Sa by Doreen Rappaport.
Story of **Yankton Sioux**, Gertrude Bonnin, who fought for justice for Indian people.

Native American Doctor by Jeri Ferris.
Story of Susan LaFlesche, **Omaha**.

Charles Eastman – **Sioux** Physician and Writer, North American Indians of Achievement Series.

Charles Eastman: Physician, Reformer, and Native American Leader by Peter Anderson.

"Mush-hole": Memories of a Residential School by Maddie Harper **(Indian Author)**, Sister Vision, 1993. **Ojibwa**

Kaibah: Recollections of a Navajo Girlhood by Kay Bennett **(Indian Author)**, Westernlore, 1964.

Children of the Circle: A Photographic History of Native American Children from 1880 to 1920 by Adolf and Star Hungry Wolf **(Indian Authors)**.

Braid of Lives: Native American Childhood by Neil Philip.

Plenty Coups by Michael Doss **(Indian Author)**, American Indian Stories Series, Raintree. **Crow**

Black Elk: Man with a Vision by Carol Greene, Children's Press, 1990.

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

An Album of the American Indian by Rosebud Yellow Robe **(Indian Author)**, Watts, 1970.

Great Native Americans by Peter Copeland.

1953 TO 2000

1953-1956	The Termination Resolution. Sixty-one groups were terminated.
1953	Congress empowered certain states to have law and order jurisdiction of Indian reservations without the consent of the tribes.
1961	Tribes allowed first opportunity to purchase individual Indian lands.
1961	Keeler Commission on Rights, Liberties and Responsibilities of the American Indian recommended self-determination/resource development
1964	The Office of Economic Opportunity was created and provided anti-poverty programs on reservations.
1964-1968	The Civil Rights Act led to the decree that states cannot assume law and order jurisdiction on reservations without the consent of tribes..
1968	American Indian Movement founded.
1968	President Johnson calls for self-determination to replace termination.
1969-1971	Indians occupied Alcatraz Island in San Francisco Bay.
1970	A federal policy of Indian self-determination was formulated.
1970	Blue Lake Wilderness Area in New Mexico returned to Taos Pueblo.
1972	AIM occupies and destroys BIA offices in Washington, DC.
1973	AIM and Oglala Sioux occupied Wounded Knee for 71 days.
1974	Federal Acts provided housing and loans to Indians for businesses.
1978	Indian activists organized the "Longest Walk" to Washington, DC.
1978	The American Indian Freedom of Religion Act passed.
1988	The Indian Gaming Act was passed.
1992	Indian people throughout the Americas protested the celebration of the Columbian Quincentennial.
2000	Indian population in U.S. 3+ Million-U.S. Census

LITERATURE FOR UNIT –

Dennis Banks – Native American Activist available from Four Winds Books, York, NE. **Ojibwa**

Ben Nighthorse Campbell – **Cheyenne** Chief, U.S. Senator, North American Indians of Achievement Series.

Peter Macdonald – Former Chairman of the **Navajo** Nation, North American Indians of Achievement Series.

Wilma Mankiller – Principal Chief of the **Cherokee**, North American Indians of Achievement Series.

Wilma P. Mankiller: Chief of the **Cherokee** by Simon Charnan, Children's, 1991.

Wilma Mankiller by Jacki Thompson Rand, American Indian Stories Series, Raintree.

Great Native Americans by Peter Copeland.

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Happily May I Walk: American Indians and Alaska Natives Today by Arlene Hirschfelder **(Indian Author)**, Scribner's Sons, 1986.

Shooting Back from the Reservation: A Photographic View of Life by Native American Youth by Jim Hubbard, New Press, 1994.

North American Indians by Herman Viola, 1996. Overview of history to present times.

An Album of the American Indian by Rosebud Yellow Robe **(Indian Author)**, Watts, 1970. An oveview of history up to 1970.

The People Shall Continue by Simon Ortiz **(Indian Author)**.
An overview of Indian history up to present times.

Arizona Traveler Guidebook: Indians of Arizona: A Guide to Arizona's Heritage by J. Jacka, Renaissance House, 1990.

Atlas of the North American Indian by C. Waldman, Facts on File, 1985.

Indian Country Map available from Four Winds Books, York, NE.

American Indian Facts of Life by George Russell **(Indian Author)** available from Four Winds Books, York NE. Indianology 101

U. S. HISTORY STANDARDS FOR INTERMEDIATE GRADES ADDRESSED –

Understands the status and complexity of pre-Columbian societies of the Americas
Understands the culture and agricultural practices of Native American societies along the eastern seaboard and in the Southwest where the first North American interactions occurred with the English and Spanish explorers

Understands the long-term consequences of the meeting of three worlds from the beginnings to 1607
Understands the redistribution of the world's population and the catastrophic losses of indigenous populations of the Americas, largely to diseases

Understands how the European colonies in North America were peopled in the colonial period (1585-1763) and how the colonists interacted with Native Americans and with one another
Understands how relations between colonists and Native Americans varied between that characterized by William Penn's peaceful relations with the Delaware chiefs to such extents as the Pequot massacre in 1637
Understands how European wars drew the English colonists along with their Indian allies into conflict with the Indian allies of Spain and France

Understands how the values and institutions of European economic life took root in the colonies
Understands the natural setting that Europeans found and the manner in which they began to shape and exploit the American land (e.g., alteration of the continent's plant and animal life, the concept of land as a commodity)

Understands the causes and character of the American Revolution, the ideas and interests involved in forging the revolutionary movement, and the reasons for the American victory
Understands the major states of the Revolutionary War and the reasons for the American victory including the role of American Indian leaders

Understands how the American Revolution changed or maintained social and economic relationships among the nation's many groups and regions, and how these relationships changed from 1754-1815
Understands the revolutionary goals of different social groups including Native Americans and the Revolution's transformation of social, political, and economic relationships among them

Understands how American external relations changed during the Revolution and in the era of the early republic (1754-1815)
Understands the relations between the new American nation and Native Americans afater the Revolution (e.g., the series of military campaigns and treaties that transferred Indian title of much of the Old Northwest territory to the new nation)

Understands U.S. territorial expansion between 1800 and 1861, and how this involved changing relations with external powers and Native Americans
Understands the frontier as a zone of cultural interaction between Native Americans already in the region and new arrivals moving westward from the eastern U.S., northwrd from Mexico, and eastward from Asia
Understands19th century federal policy toward Native Americans, including the crisis of 1829 following Jackson's election, and removal of the six southern nations to the western territories

Understands how massive immigration and internal migration after 1870 led to new social patterns, conflicts, and ideas of national unity amidst growing cultural diversity between 1870 and 1900
Understands how the Homestead Act of 1862 fueled the expansion of migration on the Great Plains and the Second Great Removal of Native Americans

Understands the foundations established during the 1920's for the nation's political economy and culture
Understands that large parts of the U.S. population, including Native Americans, were left outside the era of opportunity and advancement

Understands social changes in American society brought about by the Civil Rights movements
Understands the parallel civil rights movements of Hispanic and Native Americans (e.g., the rise of the United Farm Workers, Native American struggles for restoration of land and water rights)

- McRel Compendium of Standards, 1994.

AMERICAN INDIAN STANDARDS FOR HISTORY ADDRESSED –

The student understands the patterns of change in indigenous societies in the Americas up to the Columbus voyages.
The student is able to draw upon data provided by archaeologists and geologists to explain the origins and migration from Asia to the Americas and contrast them with Native Americans own beliefs concerning their origins in the Americas.
The student is able to trace the spread of human societies and the rise of diverse cultures from hunter-gatherers to urban dwellers in the Americas.

The student understands the differences and similarities among Africans, Europeans, and Native Americans who converged in the western hemisphere after 1492.
The student is able to compare political systems, including concepts of political authority, civic values, and the organization and practice of government.

The student is able to compare social organizations, including population levels, urbanization, family structure, and modes of communication.
The student is able to compare economic systems, including systems of labor, trade, concepts of property, and exploitation of natural resources.
The student is able to compare dominant ideas and values including religious belief and practice, gender roles, and attitudes toward nature.

The student understands the Spanish and Portuguese conquest of the Americas.
The student is able to explain and evaluate the Spanish interactions with such people as Aztecs, Incas, and Pueblos.

The student understands the European struggle for control of North America.
The student is able to compare how English settlers interacted with Native Americans in New England, mid-Atlantic, Chesapeake, and lower South colonies.

The student understands the factors affecting the course of the Revolutionary War and contributing to the American victory.
The student is able to compare and explain the different roles and perspectives in the war of men and women, including white settlers, free and enslaved African Americans, and Native Americans.

The student understands the international background and consequences of the Louisiana Purchase, the War of 1812, and the Monroe Doctrine.
The student is able to assess why many Native Americans supported the British in the War of 1812 and the consequences of this policy.

The student understands federal and state Indian policy and the strategies for survival forged by Native Americans.
The student is able to analyze the impact of removal and resettlement on the Cherokee, Creek, Chickasaw, Choctaw, and Seminole.
The student is able to investigate the impact of trans-Mississippi expansion on Native Americans.

The student understands various perspectives on federal Indian policy westward expansion, and the resulting struggles.
The student is able to compare survival strategies of different Native American societies during the second great removal.

The student understands the Second Reconstruction and its advancement of civil rights.
The student is able to evaluate the agendas, strategies, and effectiveness of various African Americans, Asian Americans, Latino Americans, and Native Americans, as well as the disabled, in the quest for civil rights and equal opportunities.

American Indian Content Standards, ORBIS Associates for Bureau of Indian Affairs.

• Background • Materials • Activities • for Language Arts-Based Units

SOME INDIAN CONTRIBUTIONS TO COMMUNICATION

Teacher's/Parent's Background Information -

Before the white man arrived, there were 300 separate languages spoken by Indians in North America. These were not dialects. They were languages that were highly grammatically complex and could not be understood by others unless they had learned them, which was often the case because tribes had to communicate with each another. It was not uncommon for Indian people to speak several different Indian languages. If they did not know another tribe's language or if they had to communicate with white people, they may have utilized sign language, especially in the Plains area.

There were many more different dialects of Indian languages. Today only half of the languages remain, and 80% of the existing Indian languages are dying. Only about 20 tribes have children who speak their language regularly. It is very important that Indian people keep their languages because culture and language cannot be separated, and if the language is lost, much of the culture will also go. Further, one who knows more than one language has an expanded base to learn other things easier.

The white man has borrowed many words from Indian languages, and they are now part of the American English language. Many place names in this country are Indian words. During World War II, the United States military utilized Indian people and their languages to send messages so that the monitoring enemy would not understand them.

LITERATURE FOR UNIT -

Native American Sign Language by Madeline Olsen.

Indian Sign Language by William Tompkins, Dover.

Clark's Indian Sign Language by W. P. Clark.

Talking Hands by Aline Amon, Doubleday.

Philip Johnson and the **Navajo** Code by Syble Lagerquist, Montana Council for Indian Education.

The Code Talkers: American Indians in World War II by Robert Daily.

The Unbreakable Code by Sara Hoagland Hunter.

Navajo Code Talkers by Nathan Aaseng, Walker & Co., 2000.

Chocolate, Chipmunks and Canoes: An American Indian Words Coloring Book by Juan S. Alverez.

Indian Place Names by John Rydjord, University of Oklahoma Press.

The Dakota's Heritage: A Compilation of Indian Place Names in South Dakota by Virginia Driving Hawk Sneve **(Indian Author)**, Brevet Press, 1973.

About Language: A Richness of Words, A Babel of Tongues by Wallace L. Chafe in The World of the American Indian, National Geographic Society.

Check your library or bookstores for other books relating to these topics.

ACTIVITIES FOR SOME INDIAN CONTRIBUTIONS TO COMMUNICATION UNIT-

1. The teacher presents an introduction from the teacher's background information.

2. Discuss the tribal language(s) spoken by local tribal group(s) and its preservation status. Have the students research this. Are there programs designed to maintain the language?

3. Research and discuss Indian sign language. Did the local tribe(s) utilize sign language?

4. Have the students learn some Indian sign language presented in a book so they get the idea of sign language. How is this sign language related to sign language for deaf people?

5. Have the students list Indian place names that they know of. Are some of them from local tribal languages?

6. Have students do research to find other Indian place names in the state or country.

7. Using a dictionary or other resource material, have students find words in the English language that came from Indian languages.

8. Have the students read about and discuss the code talkers of World War II. Did the local tribe(s) have any code talkers in that war?

9. Assign each student one of the various topics of this unit to do more extensive research , write a report and prepare a presentation with visuals on it for the class and parents.

INDIANS DEVELOPED FORMS OF WRITING

Teacher's/Parent's Background Information –

The alphabet, and thus the source of writing, had its origin in the Middle East. There are many theories about the source of the early alphabets; but it is generally assumed that the Semitic alphabet contributed to the origin of the Greek alphabet. Prior to that we had the "syllabaries" or "symbols for syllables" systems of writing from ancient Babylonian, Cyprian and Minoan scripts.

The evolution of the written word followed a distinct path in the cultures of the American Indian also. The "wampum beads" or "wampum belts" were mnemonic objects which consisted of beads of different colors, and in different positions, designed to relate historical events, treaty agreements and military campaigns. Of course, the purpose of these "wampum belts" was misunderstood by the white man and a distorted version of their usage was passed on through the history of books.

Much of the recorded history of the Mayan Indian civilization was destroyed by the Spanish Bishop Landau (when he expressed his displeasure at the "symbols of the heathens") by placing hundreds of scrolls and scriptures into huge piles and setting the torch to them. We will never know the secrets of this ancient civilization because a supposedly educated man was too ignorant to realize the importance of retaining these irreplaceable documents.

Indian tribes of the Americas, such as the ancient Peruvian Indians, used a notched stick called the "quipu" to record the events which were important to the tribe. Knotted cords of different sizes and colors were hung from the quipu to record historical happenings.

Indian tribes of the Great Plains used several methods to record the history of the tribe. Oral historians were common to most of these tribes. The "winter count" of the Lakota Nation is one evidence of an Indian tribe using a method of pictography to record tribal history.

The "winter count" consisted of a buffalo hide painted with various symbols and characters depicting important events which affected the tribe. The sequence of events recorded in this fashion has proven to be uncannily accurate. And yet, because of the superior attitude of the white man toward the Indian and what he regarded to be pagan symbolism, these documents were totally ignored by the early educators and historians. Not only were they ignored, many of the leather parchments were destroyed.

The complexity of creating an alphabet from scratch is mind-boggling. It took generations of civilizations to accomplish this formidable feat. And yet, for the only recorded time in the history of man, a single individual achieved what was considered to

be an impossibility. In New Echota, Georgia on February 28, 1828, a four page newspaper called the "Cherokee Phoenix" hit the village for the first time. The newspaper was the culmination of the dreams of one man: a Cherokee Indian (The Principal People) called the Lame One by his own tribe; but called Sequoyah by the white historians.

Unable to read or to write the white man's language, this dedicated, driven Indian man accomplished the impossible...he created an alphabet using the sounds and symbols of the Cherokee language. It is still used to this day. He became the first and only man in history to achieve this task.

Very little is said of this genius in the history books, and the only solid reminder of his greatness are the giant redwood trees of California which have been called "Sequoias" after him. Perhaps it is prophetic. Sequoyah called the first written pages of his language the "talking leaves."

- Tim Giago (**Oglala Lakota**), Editor of the Lakota Times newspaper, July 16, 1981. In American Indians: Language and Literature, ORBIS Associates, Washington, DC, 1987.

In addition, pictographs and petroglyphs, other early forms of Indian writing, have been found on rocks or rock walls all over the United States.

LITERATURE FOR INDIANS DEVELOPED FORMS OF WRITING UNIT –

Wampum Belts of the **Iroquois** by Ran Fadden, Tehanetorens (**Indian Author**), Book Pub., 1999.

Wampum by Anne Molloy, Hastings, 1976.

Sequoyah-Inventor of the **Cherokee** Alphabet, North American Indians of Achievement Series.

Sequoyah and His Miracle by William L. Roper, Montana Council for Indian Education.

Sequoyah's Gift: A Portrait of the **Cherokee** Leader by J. Klausner, Harper Collins, 1993.

Sequoyah and the **Cherokee** Alphabet by R. Cwiklik, Silver Burdett Press, 1989.

Picture Writing of the American Indians by Garrick Mallery. Vols. 1 & 2.

Sioux Winter Count – A 131 Year Calendar of Events by Roberta Carkeek Cheney.

Stories on Stone: Rock Art, Images from the Ancient Ones by Jennifer Dewey, 1996.

Native American Rock Art: Messages from the Past by Yvette LaPierre and others, 1994.

Stones, Bones and Petroglyphs: Digging into **Southwest** Archeology by Susan Goodman, 1998.

Messages on Stone by W. M. Stokes, Starstone Pub., 1980.

Before You Came This Way by Byrd Baylor, Dutton, 1969.

Guide to Indian Rock Carvings of the Pacific **Northwest** Coast by Beth Hill, Hancock, 1980.

Check your library or bookstores for other books relating to these topics.

ACTIVITIES FOR INDIANS DEVELOPED FORMS OF WRITING UNIT -

1. The teacher provides an introduction from the teacher's background information.

2. Have the students do research on and discuss wampum belts.

3. Have the students find out where the wampum belt that told the story of Benjamin Franklin's visit to the Iroquois is now located.

4. Have the students do research on and discuss pictographs, winter counts and petroglyphs.

5. Have the students visit and view places where there are pictographs, winter counts or petroglyphs, if available.

6. Have the students read together a book about Sequoyah, discussing as they read along. Are there Indian newspapers today? Are they written in English or the native language? Who writes them? Who is Tim Giago?

7. Have the students review the writing system for the local tribal language(s) and do research to find out how it was developed. If there is no writing system, what is the reason for it? Some tribes don't allow their languages to be written.

8. Assign each student to one of the various topics in this unit to do further research, write a report and prepare a presentation with visuals on it for the class and parents.

INDIAN AUTHORS

Teacher's/Parent's Background Information –

Today there are many Indian authors of all kinds of works. This unit, however, will focus on Indian authors of books written for children. All of the authors included have written other kinds of books as well.

There are still not enough Indian authors for children, but there are many more than there used to be, and they are producing wonderful books to be read by both Indian and nonIndian children. Book about Indians written by nonIndians often contain biased or inaccurate information about Indian people. It is a great thing to have reading material for children by Indian authors that will make Indian young people proud of who they are and will provide nonIndian children with correct depictions of Indian people. Both Indian and nonIndian children need to know that there are Indian authors, and that they, too, can become authors.

LITERATURE FOR INDIAN AUTHORS UNIT-

Bowman's Store: A Journey to Myself by Joseph Bruchac (**Abenaki**), Dial, 1997.

Seeing the Circle by Joseph Bruchac (**Abenaki**),Richard C. Owen.

Eagle Song by Joseph Bruchac (**Abenaki**), Dial, 1997.

Fox Song by Joseph Bruchac (**Abenaki**), Philomel, 1993.

The Heart of a Chief by Joseph Bruchac (**Abenaki**).

Children of the Longhouse by Joseph Bruchac (**Abenaki**), Dial, 1996.

The Arrow Over the Door by Joseph Bruchac (**Abenaki**).

Native North American Literary Companion by Joseph Bruchac (**Abenaki**) and Janet Witalec, Visible Ink, 1998.

The Chichi Hoohoo Bogeyman by Virginia Driving Hawk Sneve (**Lakota**), University of Nebraska Press, 1975.

High Elk's Treasure by Virginia Driving Hawk Sneve (**Lakota**), Holiday House, 1972.

Jimmy Yellow Hawk by Virginia Driving Hawk Sneve (**Lakota**), Holiday House, 1972.

When Thunders Spoke by Virginia Driving Hawk Sneve (**Lakota**), 1993.

Sees Behind Trees by Michael Dorris (**Modoc**), Hyperion.

The Window by Michael Dorris (**Modoc**), Hyperion.

Morning Girl by Michael Dorris (**Modoc**), Hyperion.

Guests by Michael Dorris (**Modoc**), Hyperion.

Grandmother's Pigeon by Louise Erdrich (**Ojibwa**), Hyperion, 1999.

The Birchbark House by Louise Erdrich (**Ojibwa**), Hyperion.

The Good Luck Cat by Joy Harjo (**Muscogee Creek**).

Songs of Shiprock Fair by Luci Tapahonso (**Navajo**), Kiva Press, 1999.

Navajo ABC, A Dine Alphabet book by Luci Tapahonso (**Navajo**), Aladdin, 1999.

Circle of Wonder: A Native American Christmas Story by N. Scott Momaday (**Kiowa**).

Little Badger and the Fire Spirit by Maria Campbell (**Metis**), McClelland & Stewart.

People of the Buffalo by Maria Campbell (**Metis**), Douglas & McIntyre, 1976.

ACTIVITIES FOR INDIAN AUTHORS UNIT -

1. Teacher provides introduction from the teacher's background information.

2. The students read the same book and utilize the literature circle approach assigning some students to the various tasks to enhance the reading.

3. Have the students do research on the authors. Information may be found in their books. The book "Native North American Literary Companion" and other anthologies including Indian authors will provide some information.

4. Assign the students to various books that they will be responsible for reading. Do book project with written report and visuals to share.

5. There are more Indian authors of children's books than are included here. Have students utilize the lists of books in other units in this book to locate other Indian authors, find books by them in the library and determine what tribes they are. List other Indian authors, especially of the local tribe(s).

STUDENT WRITING

Teacher's/Parent's Background Information –

It is very important that Indian children become good writers. Many schools are trying harder to teach children to write well. There is a great need for Indian people to know how to write effectively. Tribal government workers, for example, acquire money and programs for the tribal members by writing proposals that must compete with others for funding. Some Indian young people may eventually make their living by writing; maybe they will be authors or news reporters and be able to tell the story of Indian people. All people need to be able to write well to function in society.

This unit will highlight the published works of Indian children. Some schools informally publish their children's work and that is just as important and should be included and read by other children. Children's written work should be published regularly.

LITERATURE FOR STUDENT WRITING UNIT-

Courageous Spirits: Aboriginal Heroes of Our Children by Jo-ann Archibald, Val Friesen and Jeff Smith (**Indian Author**), Theytus, 1993. **Canada**

Navajo: Visions and Voices Across the Mesa by Shonto Begay (**Indian Author**), Scholastic, 1995.

Giving: **Ojibwa** Stories and Legends, Children of Curve Lake Reserve, Waapoone, 1985.

A Rainbow at Night: The World in Words and Pictures by **Navajo** Children by Bruce Hucko, Chronicle, 1996.

Byron Through the Seasons: A **Dene**-English Story Book, Children at Ducharme Elementary School, Fifth House.

We Are All Related: A Celebration of Our Cultural Heritage by George Littlefield (**Indian Author**).

When the Rain Sings: Poems by Young Native Americans by Lee Francis (**Indian Author**), Simon & Schuster, 1999.

Angwamas Minosewag **Anishinabeg**: Time of the Indian, students of the Red School House, Indian Country Communications, 1977.

Just Talking About Ourselves: Voices of Our Youth (Vols. 1, 2 & 3) by Marlena Dolan, Theytus, 1994.

Check your library and bookstores for other books relating to this topic.

ACTIVITIES FOR STUDENT WRITING UNIT-

1. Teacher provides an introduction based on the teacher's background information.

2. Have students read and respond to the works of other students from other places and/or classes.

3. Stress the use of a writing process such as: pre-writing, first draft, peer conference, revise, edit, publish, and share. Let them know that authors and students who have their works published follow this, or a similar, process.

4. Have students write poetry.

5. Have students write short stories.

6. Have students figure the cost of publishing their work in a booklet(s) and how much they would have to charge if they sold them.

7. Have a book signing event that is planned by the students. Have the students sign copies of their own works or their class's work(s) for their family members, other teachers or other attendees. Have the other teachers ensure that all students have the opportunity to sign works.

8. Have the students make posters advertising the book signing event and plan and purchase snacks to be served after being given a budget.

9. Enter students' works in writing contests or in opportunities to be published.

10. Have the school publish a book including works from several classes.

THE ORAL TRADITION AND ORATORY

Teacher's/Parent's Background Information -

Indian people are known for having an oral tradition. Even though they developed forms of writing, their main way of handing down history and stories was by telling such information to others. Indian people have great stories. The stories are connected to other activities in life. The oral tradition has also helped to protect information from being provided to outsiders. Some tribes will still not allow certain stories or information on ceremonies to be written down.

Indian people were also great orators. Although they usually used few words, their words sent powerful messages. Consider the following:

"Everything on earth has a purpose and every person a mission."- Mourning Dove, Salish

"I have seen that in any great undertaking it is not enough for a man to depend simply upon himself." – Lone Man, Lakota

"Your mother's the one that does everything for you. The Mother Earth does the same." – Lena Sooktis, Northern Cheyenne

"You must speak straight so that your words may go as sunlight into our hearts." – Cochise, Apache

"Somebody will always be looking at you as an example of how to behave. Don't let them down." – Karen Wynn, Yokuts

"Politeness goes far, yet costs nothing." – Seneca

"The more you know, the more you will trust and the less you will fear." – Medewiwin, Ojibway

"Live a quiet life and be kind to all, and listen to the advice of the old. People will respect you if yu do this." – Nodinens, Chippewa

"My children, as you travel along life's road never harm anyone, nor cause anyone to feel sad." – Winnebago

"Teach children what is right to do and they will live that way and get on well in the world." - Chippewa

"If everyone did something for somebody else, there wouldn't be anyone in need in the whole world." – Marlene Richard, Tuscarora

LITERATURE FOR THE ORAL TRADITION AND ORATORY UNIT –

Sing Like a Hermit Thrush by Richard G. Green (**Indian Author**), Ricara Feature.

Little White Cabin by Ferguson Plain (**Indian Author**), Pemmican Publications.

Earthmaker's Lodge: American Indian Folklore, Activities and Foods by Barrie Kavasch, Cobblestone Pub.

Native American Games and Stories by Joseph Bruchac (**Indian Author**), Fulcrum Resources.

A Natural Education: Native American Ideas and Thoughts by Stan Padilla (**Indian Author**), Book Pub. Co., 1994.

Words of Power: Voices from Indian America by Norbert Hill, Jr. (**Indian Author**), Fulcrum Pub., 1994.

Check your library or bookstores for other books relating to this topic.

ACTIVITIES FOR UNIT –

1. The teacher presents introduction from the background information.
2. Have the students read and/or hear about how the oral tradition is important including learning from elders and sharing stories and knowledge to keep the culture alive. Discuss the appropriate use of language in various situations.
3. Have the students read and/or hear about storytelling ties to other activities in Indian lives.
4. Have the students participate in activities that are tied to storytelling.
5. Have the students read some of the Indian oratory presented here and in other books. Have them paraphrase the statements.
6. Have the students do research on those who made the statements, if known.
7. Have the students memorize some of the Indian oratorical statements and present them to the class, school or families
8. Have students write papers on why the oral tradition is important to them and to their tribe(s).

INDIAN STORIES

Teacher's/Parent's Background Information –

As a part of the oral tradition, Indian people told stories. Their stories often taught lessons to the young people. Grandparents were most often the storytellers. Some stories were very long and could not be told in one sitting. Stories were usually only told at certain times, mainly in the wintertime. Indian stories are often referred to as legends, stories coming down from the past. It is important to preserve the Indian stories and storytelling among Indian people.

"Legends are an important and integral part of the Native American culture. Legends are a vehicle for teaching young people lessons and proper behavior, maintaining and recording Indian community history and an oral preservation of traditional beliefs and values explaining natural phenomenon and teaching respect to the natural world. All Indian tribes have recognized the importance of preserving this oral tradition."
– Legends Across Indian Nations, ORBIS Associates, Washington, DC.

LITERATURE FOR INDIAN STORIES UNIT -

One More Story: Contemporary **Seneca** Tales of the Supernatural by Du Wayne Leslie Bowen **(Indian Author)**, Greenfield Review, 1991.

Tales from the Longhouse by British Columbia Indian Arts Society, Gray's, 1973. **Salish**

The Boy Who Lived with the Bears and Other **Iroquois** Stories by Joseph Bruchac **(Indian Author)**, Harper Collins, 1995.

The Faithful Hunters: **Abenaki** Stories by Joseph Bruchac **(Indian Author)**, Bowman, 1988.

Hoop Snakes, Hide Behinds and Side-Hill Winders: Tall Tales from the **Adirondacks** by Joseph Bruchac **(Indian Author)**, Crossing, 1991.

Iroquois Stories: Heroes and Heroines, Monsters and Magic by Joseph Bruchac **(Indian Author)**, Crossing, 1985.

Native Animal Stories or Keepers of the Animals by Joseph Bruchac **(Indian Author)**, Fulcrum. **Many tribes**

Native American Stories or Keepers of the Earth by Joseph Bruchac **(Indian Author)**, Fulcrum. **Many tribes**

Native Plant Stories or Keepers of Life by Joseph Bruchac (**Indian Author**), Fulcrum. **Many tribes**

Keepers of the Night by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1994. **Many tribes**

Return of the Sun: Native American Tales from the **Northeast** Woodlands by Joseph Bruchac (**Indian Author**), Crossing, 1989.

Stone Giants and Flying Heads: Adventure Stories from the **Iroquois** by Joseph Bruchac (**Indian Author**), Crossing, 1979.

The Wind Eagle and Other **Abenaki** Stories by Joseph Bruchac (**Indian Author**), Bowman, 1985.

When the Chenoo Howls by Joseph Bruchac (**Indian Author**), Walker Books.

Grandfather Stories of the **Navajos** by Sydney A. Callaway, Gary Witherspoon and Others (**Indian Authors**), Rough Rock, 1974.

Son of Raven, son of Deer by George Clutesi (**Indian Author**), Clutesi Agencies, 1994. **Northwest**

Adventures of Nanabush: **Ojibway** Indian Stories by David Coatsworth, Atheneum, 1979.

Grandmother's Gift: Stories from the **Anishinabeg** by Ann M. Dunn (**Indian Author**), Holy Cow!, 1997.

When Beaver Was Very Great: Stories to Live By by Ann M. Dunn (**Indian Author**), Midwest Traditions, 1995.

Seneca Indian Stories by Leo Cooper, Ha-yen-doh-nees (**Indian Author**), Bowman, 1995.

Tales the Elders Told by Basil Johnson (**Indian Author**), Royal Ontario Museum, 1981. **Ojibway**

Ktunaxa Legends, Kootenai Culture Committee, Confederated **Salish and Kootenai** Tribes, Salish Kootenai College, 1997.

Lakota and Dakota Wisdom Stories by Mark W. McGinnis and Pamela Greenhill Kaizen (**Indian Author**), Tipi, 1994.

Old Father Story Teller by Pablita Velarde (**Indian Author**), Clear Light, 1989. **Pueblo**

Coyote Stories by Mourning Dove, Humishuma (**Indian Author**), University of Nebraska, 1990.

Walk in Peace: Legends and Stories of the **Michigan** Indians by Simon Otto (**Indian Author**), Michigan Indians, 1990.

Skunny Wundy: **Seneca** Indian Tales by Arthur C. Parker (**Indian Author**), Syracuse University, 1994.

Coyote Stories of the **Navajo** People by Robert A. Roessel and Dillon Platero (**Indian Author**), Rough Rock, 1973.

Tagish Tlaagu/**Tagish** Stories by Angela Sidney (**Indian Author**), Council for Yukon Indians, 1982.

The Princess and the Sea Bear and Other **Tsimshian** Stories by Joan Skogan, Polestar, 1992.

Pachee Goyo: History and Legends from the **Shoshone** by Rupert Weeks (**Indian Author**), Jelm Mountain, 1981.

Kwulasulwut: and KwulasulwutII: Stories from the Coast **Salish** by Ellen White (**Indian Author**), Theytus, 1981 and 1997.

The Snake That Lived in the Santa Cruz Mountains and Other **Ohlone** Stories by Linda Yamane (**Indian Author**), Oyate, 1998.

American Indian Stories by Gertrude Bonin, Zitkala-Sa (**Indian Author**), University of Nebraska Press, 1979. **Dakota**

Old Indian Legends by Gertrude Bonin, Zitkala-Sa (**Indian Author**), University of Nebraska Press, 1985. **Dakota**

Grandfather's Story of **Navajo** Monsters by Richard Red Hawk (**Indian Author**), Sierra Oaks.

Creation of a **California** Tribe by Lee Smith and Clifford E. Trafzer (**Indian Authors**), Sierra Oaks.

The Boy Who Made Dragonflies by Tony Hillerman, University of New Mexico Press, 1972. **Zuni**

Earthmaker's Lodge: American Indian Folklore, Activities and Foods by Barrie Kavasch. **Many tribes**

Skywoman: Legends of the **Iroquois** by Joanne Shenandoah (**Indian Author**) and others, 1998

Myths and Legends of the **Sioux** by Marie L. MacLaughlin, Tumbleweed Press.

Earth Lodge Tales from the Upper Missouri: Traditional Stories of the **Arikara, Hidatsa** and **Mandan**, Mary College.

Navajo Coyote Tales by William Morgan (**Indian Author**).

Stories of the **Sioux** by Luther Standing Bear.

Pushing Up the Sky: Seven Native American Plays for Children by Joseph Bruchac (**Indian Author**), Dial, 2000. **Several tribes**

Stories of the Metis by B. Sealey, Manitoba **Metis** Federation Press.

Check your library or bookstores for other books of Indian legends, especially those of the local tribe(s).

ACTIVITIES FOR INDIAN STORIES UNIT-

1. The teacher provides introduction from the teacher's background information.

2. Have the students read and discuss Indian stories, mainly from their own local tribe(s) or regions. Do they teach lessons? When are they to be told?

3. Have the students verify the accuracy of the stories from local tribes by conferring with tribal elders, etc. There may be other versions that are more accepted by the local people.

4. If it is the appropriate time, have an elder(s) visit the classroom and tell some stories. Have the students write a letter to the elder(s) inviting them.

5. Have the students retell stories to promote the oral tradition.

6. Have the students present a play based upon a tribal story for the school and parents.

7. Have the students ask their parents to relate stories they heard when they were young.

8. Have the students create a booklet of tribal stories. Have them use the writing process so it will be as professional as possible.

INDIAN BIOGRAPHIES

Teacher's/Parent's Background Information –

It is important that Indian children know about modern Indian people who are known for their accomplishments. Knowing their successes and how they overcame adversity should help to motivate and support young Indian people. Biographies and autobiographies included here are the stories of Indian artists, writers, tribal and other government officials, activists, performing artists, athletes, scientists and a medicine man. Students also need to know the biography/autobiography as a form of literature.

LITERATURE FOR INDIAN BIOGRAPHIES UNIT-

Tending the Fire: The Story of Maria Martinez by Juddi Morris. **Pueblo Potter**

Maria Martinez by Mary Carroll Nelson, Dillon. **Pueblo**

Helen Cordero and the Storytellers of **Cochiti Pueblo** by Nancy Howard.

This Land Is My Land by George Littlechild (**Indian Author & Artist**), Children's Book, 1993. **Cree**

R. C. Gorman-**Navajo** Artist available from Four Winds Books, York, NE.

Patrick DesJarlait: Conversations with a Native American Artist by Neva Williams, Runestone, 1994. **Ojibway**

Daisy Hooee Nampeyo: The Story of an American Indian by Carol Fowler, Dillon, 1977. **Pueblo**

Oscar Howe by John Milton, Dillon, 1972. **Dakota**

Michael Naranjo by Mary Carroll Nelson, Dillon. **Pueblo**

Pablita Velarde by Mary Carroll Nelson, Dillon. **Pueblo**

Bowman's Store: A Journey to Myself by Joseph Bruchac (**Indian Author**), Dial, 1997. **Abenaki**

William Warren by Will Antell (**Indian Author**), Dillon, 1973. **Ojibwa**

Ben Nighthorse Campbell-**Cheyenne** Chief; U.S. Senator, Native American Indians of Achievement Series.

Peter Macdonald-Former Chairman of the **Navajo** Nation, Native American Indians of Achievement Series.

Wilma Mankiller-Principal Chief of the **Cherokee**, Native American Indians of Achievement Series.

Wilma Mankiller by Jacki Thompson Rand, Native American Stories, Raintree Pub.

Wilma P. Mankiller: Chief of the **Cherokee** by Simon Charnan, Children's, 1991.

Robert Bennett by Mary Carroll Nelson, Dillon. **Oneida**

Annie Wauneka: The Story of an American Indian by Mary Carroll Nelson, Dillon, 1972. **Navajo**

Dennis Banks-Native American Activist, available from Four Winds Books, York , NE. **Ojibwa**

Will Rogers-**Cherokee** Entertainer, available from Four Winds Books, York, NE.

Will Rogers: Larger Than Life by Debbie Dodey, 1999.

Maria Tallchief-**Osage** Prima Ballerina, available from Four Winds Books, York, NE.

Maria Tallchief by Heidi Erdich, Native American Stories, Raintree Pub. **Osage**

Maria Tallchief: The Story of an American Indian by Marion Gridley, Dillon, 1973.

Jim Thorpe-**Sac & Fox** Athlete, Native American Indians of Achievement Series.

Jim Thorpe by Edward F. Rivinus, Native American Stories, Raintree Pub. **Sac & Fox**

Jim Thorpe by Robert Reising, Dillon, 1974. **Sac & Fox**

Billy Mills by Billy Mills (**Indian Author**), Dillon, 1971. **Lakota**

James Joe, **Navajo** Medicine Man by Susan Thompson

Scientist from **Santa Clara Pueblo**: Agnes Naranjo Stroud-Lee by Mary Ellen Verheyden-Hilliard, 1985.

Katie Henio, **Navajo** Sheepherder by Peggy Thompson, Cobblehill, 1995.

Engineer from the **Comanche** Nation: Nancy Wallace by Mary Ellen Verheyden-Hilliard, 1985.

Encyclopedia of Native American Biography by Bruce Johnson & Donald Grinde, Jr.

An Album of the American Indian by Rosebud Yellow Robe (**Indian Author**), Franklin Watts, 1969

A Time for Native Americans, Four Biographical Card Games available from Four Winds Indian Books.

Great Native Americans by Peter Copeland.

ACTIVITIES FOR INDIAN BIOGRAPHIES UNIT-

1. The teacher provides an introduction based on the teacher's background information.

2. Have the students read one of the biographies or autobiographies together, especially if it is about someone of a local tribe.

3. Assign various biographies/autobiographies to the students. Have the students be responsible for informing other students about the people they are reading about by giving presentations and preparing written reports.

4. Have the students determine if their biography is written by an Indian author. Have them do research on the author.

5. Have the students pinpoint on a map the various tribes represented by the people they are reading about. Have them figure how far away from their homes some of them went to live, go to school or work.

6. Have the students do a chart with timelines indicating the birth dates (and deaths) of the people they are reading about to get an idea of when they accomplished various things, etc.

7. Have the students find how many Indian people there are in the United States and what percent of the total population they comprise. Have them discuss the need for Indian professionals in all areas because of the struggles Indian people have as a small group in this country.

8. Have the students search the library to locate biographies of Indian people from the local tribe, even if they are written for adults.

9. Have the students interview people in the community and write short biographies about them. Have the students prepare a list of the questions they will all ask. Publish a book of biographies of local people.

READING ABOUT CONTEMPORARY INDIAN CHILDREN

Teacher's/Parent's Background Information –

When authors write fictional stories about people and their lives, the inclusion of inaccurate information and cultural bias is very possible. As children read about other children, fictional or not, they need to be given positive and realistic images of them and depictions of situations that they, as children, deal with. When culture is concerned, the author owes it to the people about whom he/she is writing to be as accurate as possible and not to be judgmental if the culture is different from their own.

Today there are many books written about Indian children. Teachers have to be careful to select those that will portray Indian children in the best light and to tell the story of their cultural backgrounds correctly.

LITERATURE FOR UNIT -

Kevin Cloud, **Chippewa** Boy in the City by Carol Ann Bales, Reilly & Lee, 1972.

Eagle Song by Joseph Bruchac **(Indian Author)**, Dial, 1997. **Mohawk**

Fox Song by Joseph Bruchac **(Indian Author)**, Philomel, 1993. **Abenaki**

The Heart of a Chief by Joseph Bruchac **(Indian Author)**.

Number Four by Molly Cone, Houghton Mifflin, 1972. **Northwest**

Dennis by Sarah Dixon, Cypress, 1979. **Kwakiutl**

Morning Arrow by Nanabah Chee Dodge **(Indian Author)**, Lothrop, 1975. **Navajo**

Finding One's Way: The Story of an **Abenaki** Child, Franklin Northwest Supervisory Union Title IV Indian Education Program, Abenaki Self-Help Associatioin, 1987.

The Chichi Hoohoo Bogeyman by Virginia Driving Hawk Sneve **(Indian Author)**, University of Nebraska Press, 1975. **Lakota**

High Elk's Treasure by Virginia Driving Hawk Sneve **(Indian Author)**, Holiday House, 1972. **Lakota**

Jimmy Yellow Hawk by Virginia Driving Hawk Sneve **(Indian Author)**, Holiday House, 1972. **Lakota**

Grandmother's Pigeon by Louise Erdrich **(Indian Author)**, Hyperion. **Ojibwa**

When Thunders Spoke by Virginia Driving Hawk Sneve (**Indian Author**), Holiday House, 1993. **Lakota**

Shannon: An **Ojibway** Dancer by Sandra King (**Indian Author**), Lerner, 1993.

Dancing Feathers by Cristel Kleitsch and Paul Stephens, Annick, 1987. **Ojibwa**

A Time to Be Brave by Cristel Kleitsch and Paul Stephens, Annick, 1987. **Ojibwa**

Less Than Half, More Than Whole by Kathleen and Michael Lacapa (**Indian Authors**), Northland, 1994. **Southwest**

Dancing Rainbows: A **Pueblo** Boy's Story by Evelyn Clarke Mott, Cobblehill/Dutton, 1996.

Kinaalda: A **Navajo** Girl Grows Up by Monty Roessel (**Indian Author**), Lerner, 1993.

Muskrat Will Be Swimming by Cheryl Savageau (**Indian Author**), Northland, 1996. **Abenaki**

Pueblo Storyteller by Diane Hoyt-Goldsmith.

The Window by Michael Dorris (**Indian Author**), Hyerion.

Cloudwalker: Contemporary Native American Stories by Joel Monture, Teionhehkwen. (**Indian Author**).

Owl in the Cedar Tree by Natachee Scott Momaday (**Indian Author**). **Navajo**

Dezbah and the Dancing Tumbleweed by Margaret Garaway. **Navajo**

A Trip to a Pow Wow by Richard Red Hawk (**Indian Author**), Sierra Oaks.

Circle of Wonder: A Native American Christmas Story by N. Scott Momaday (**Indian Author**).

Eagle Drum by Robert Crum, Four Winds Press, 1994. **Salish**

Charlie Young Bear by Katherine Von Ahnen, Council for Indian Education. **Mesquakie**

When Grandfather Journeys into Winter by Craig Kee Strete (**Indian Author**), Greenwillow, 1979.

Pueblo Boy: Growing Up in Two Worlds by Marcia Keegan.

Pueblo Girls: Growing Up in Two Worlds by Marcia Keegan.

Thunder Bear and Ko: The Buffalo Nation and the **Nambe Pueblo** by Susan Hazen-Hammond.

Jingle Dancer by Cynthia Leitrich Smith (**Indian Author**).

Dream Quest by Amy Jo Cooper, Annick Press, 1987. **Ojibwa**

A Story to Tell: Traditions of a **Tlingit** Community, We Are Still Here Series, Lerner.

Weaving, A California Tradition, We Are Still Here Series, Lerner.

Powwow Summer by Marcie Rendon (**Indian Author**).

Home to Medicine Mountain by Chiori Santiago, Children's Book Press, 1998.

ACTIVITIES FOR READING ABOUT CONTEMPORARY INDIAN CHILDREN UNIT-

1. Teacher provides an introduction based on teacher's background information.

2. Have the class read a book about an Indian child (children) together, especially one about a child from a tribe in their region. Have them utilize the literature circle process for discussing it. Is it fiction or nonfiction? If it is from their tribe, can the students see any inaccuracies or bias? How are their lives the same or different from the child(ren) in the book?

3. Have the class read a fiction book together if they have already read a nonfiction book or a nonfiction book if they have already read a fiction book. Have them utilize the literature circle process.

4. Assign the students various books that they are to read and share with the class. Have the students write a report and do a book project with visuals including telling what the child's tribe is in the book and where that tribe is located. Is it written by an Indian or nonIndian author?

5. Have the students write books about themselves or a friend. Give them certain questions or an outline to follow. If they write about themselves, what form of literature is it? Have them follow the writing process carefully as real authors do.

6. Have the stories published.

LANGUAGE ARTS STANDARDS ADDRESSED IN CREATING SACRED PLACES FOR CHILDREN IN GRADES 4-6 -

Standard - Gathers information effectively through reading, listening and viewing
Benchmarks –
Provides an accurate summary of basic plot of complex stories the student has read, heard or viewed
Provides an accurate summary of the main themes of complex expository information the student has read, heard or observed
Determines meaning of complex words from context
Makes and confirms simple predictions about what will be found in a text
Creates mental representations for abstract information read, heard or viewed

Standard – Reads and responds to literature
Benchmarks –
Makes connections between specific episodes in the student's own life and specific elements of a literary text
Uses specific aspects of literature to better understand the actions of others in the student's life
Understands the complexity of the various component parts of stories and their interconnections
Shares responses to literature with peers

Standard – Communicates ideas and information in writing
Benchmarks –
Makes observations regarding strengths and weaknesses of own writing
Revises compositions for internal logic
Uses a variety of methods to plan and design compositions including discussions with peers, dramatizations, graph representations and pictures
Identifies topic, audience, purpose and genre for composition
Composes comprehensive and detailed stories
Uses writing to help accomplish real world tasks
Effectively attends to standard conventions of grammar, punctuation and spelling when writing for formal audiences
Uses notes and letters to communicate ideas, feelings and information
Writes legibly
Seeks help from others to improve writing
Understands the importance of editing
Composes effective informational essays that require gathering information
Identifies personal strengths, weaknesses and preferences regarding writing in different genre

Standard –Understands and applies basic principles of language use
Benchmarks –Identifies specific ways in which language varies across situations in life

Identifies the social context of conversations and its effect on the language used in conversations
Identifies the use of nonverbal cues used in conversation
Makes observations about language in real life situations
Identifies appropriate and inappropriate uses of language in different settings including school and home
Compares the ways in which language is used in a variety of contexts
Makes observations about specific uses of own language
Compares the uses of language in the home, community and school

- McRel Compendium of Content Standards, 1994.

AMERICAN INDIAN LANGUAGE AND LITERACY CONTENT STANDARDS ADDRESSED IN CREATING SACRED PLACES FOR CHILDREN IN 4-6 –

Indian students should be able to –

Listen for meaning and gain information from spoken English and a Native language.

Listen to Indian stories told in the oral tradition, comprehend their teachings and be able to retell them.

Speak coherently, conveying ideas in both English and a Native language.

Read fluently and independently, a variety of materials including those with American Indian themes.

Locate and use a variety of texts to gain information, for example, historical materials about their tribe, tribal legends and stories and oral history transcription.

Be familiar with children's literature with Indian themes, especially with that pertaining to the student's tribe and literature written by Indian authors.

Understand the significance of Indian languages in past and present Native cultures and their contributions to American culture, e.g. words in the English language, place names, (role of) code talkers.

Know that Indian people historically had forms of record keeping such as wampum belts, quipus, pictographs – and that some Indian Nations developed writing systems such as the Cherokee syllabary, and that many Native languages are now written in their own orthographies.

- ORBIS Associates for the Bureau of Indian Affairs, 1996.

MATHEMATICS STANDARDS ADDRESSED IN CREATING SACRED PLACES FOR CHILDREN IN GRADES 4-6 –

Effectively uses a variety of strategies within the problem solving process

Understands and applies basic and advanced properties of numbers

Uses basic and advanced procedures while performing the process of computation

Understands and applies basic and advanced methods of measurement

Understands and applies basic and advanced concepts of geometry

Understands and applies basic and advanced concepts of data analysis and distributions

Understands and applies basic and advanced concepts of probability and statistics

Understands and applies basic and advanced properties of functions and algebra

- McREL Compendium of Content Standards, 1994.

AMERICAN INDIAN MATHEMATICS STANDARDS ADDRESSED IN CREATING SACRED PLACES FOR CHILDREN IN GRADES 4-6 –

Mathematics as Problem Solving –
Indian children should acquire confidence in using mathematics through understanding that American Indians have always realized the importance of mathematical concepts and problem solving and have contributed to the field of mathematical content.

Mathematics as Communication –
Indian children should discuss mathematical ideas and make conjectures and convincing arguments such as explaining the use of various geometric figures in the design of traditional American Indian homes.

Mathematics as Reasoning –
Indian students should believe that mathematics makes sense within their home and tribal/community worlds and articulate examples of how it makes sense.

Mathematical Connections –
Indian students should use mathematics in other curriculum areas by developing their own story problems derived from American Indian themes, or by calculating distances on maps related to Indian history.

Indian students should explore problems and describe results using, graphical, numerical, physical, algebraic, and verbal mathematical models or representations and relate problems to tribal demographics.

Estimation –
Indian students should recognize when estimation is appropriate through practice activities which demonstrate that Indian people in the past used estimation when trading for goods, when measuring, etc.

Number Sense and Numeration –
Indian students should understand the numeration system by relating counting, grouping, and place value concepts and reinforcing these concepts by becoming familiar with the Inca and Mayan systems.
Indian students should interpret the multiple use of numbers encountered in the real world including the significance of certain numbers such as four and seven for many American Indian tribes.

Concepts of Whole Number Operations –
Indian students should develop meaning for operations by modeling and discussing a rich variety of problem situations including some associated with scoring American Indian games and problems derived from Indian literature and history.

Geometry and Spatial Sense –
Indian students should identify, describe, compare, and classify geometric figures from various American Indian art forms to learn concepts related to plane and solid geometry.

Measurement –
Indian students should understand the attributes of length, capacity, weight, mass, area, volume, time, temperature and angle and relate these measures to use in their own cultural, home, tribal or community worlds.
Indian student should develop the process of measuring and concepts related to units of measurement including examples of measurement in Indian art and architecture and other aspects of Indian life.

Statistics and Probability –
Indian students should construct, read and interpret displays of data related to local tribal/community demographics.
Indian students should explore concepts of chance related to Indian stick and hand games.

Fractions and Decimals –
Indian students should apply fractions and decimals to real world, cultural experiences.

Patterns and Relationships –
Indian students should represent and describe mathematical relationships utilizing patterns found in Indian art and design.

WHERE TO GET BOOKS

North American Native Authors Catalog, Greenfield Review Press, P.O. Box 308, Greenfield Center, New York 12833 (518) 583-1440 http://nativeauthors.com

Indian Books Catalog, Four Winds Indian Books, P.O. Box 544, York, NE 68467-0544 (402) 362-5654 http://www.fourwindsbooks.com

Amazon.com Bookstore and bookcenter@nativeweb.org All selections are linked directly to Amazon.com bookstore so that you may purchase them online at a discount.

Prairie Edge Book and Music List, Prairie Edge, 6th & Main, Rapid City, SD 57701 (800) 541-2388 prairie@rapidnet.com www.prairieedge.com

Native American Catalog, Book Publishing Company, P.O. Box 99, Summertown, TN 38483 (931) 964-3571 bookpubl@usit.net

The Native Book Centre, 150 York Hill Blvd., Thornhill, Ontario, Canada L4J 2P6 (905) 881-7804 http://www.9to5.com/9to5/NBC/

Medicine Root Inc., Native Earth Products of North America, P.O. Box 353, Louisville, CO 80027 (303) 661-9819 Fax (303) 664-5139

Pemmican Publications, Unit #2 – 1635 Burrows Ave., Winnepeg, Manitoba R2X 0T1 Canada (204) 589-6346 pemmican@fox.nstn.ca http://fox.nstn.ca/~pemmican

Clear Light Distribution, 823 Don Diego, Santa Fe, NM 87501 (800) 253-2747 www.clearllightbooks.com

Tipi Press, St. Joseph's Indian School, Chamberlain, SD 57326 (800) 229-5684

The Haskell Foundation, 155 Indian Avenue, Lawrence, KS 66046 (785) 749-8417 Little Books Series commissioned by BIA in 1930-50. Many by Ann Nolan Clark.

Talking Leaves Book Store, P.O. Box 519, Cherokee, NC 28719 (828) 497-6044

REVIEWING BOOKS/MATERIALS

Won in the Classroom, Guidelines for the Selection of Culturally Appropriate Materials, Indian Community School of Milwaukee, Inc. (414) 345-3040 www.ics-milw.org

Through Indian Eyes: The Native Experience in Books for Children by Beverly Slapin and Doris Seale, University of California, 1998. Oyate, 2702 Mathews St., Berkeley, CA 94702

TEACHER RESOURCES

Earth's Caretakers and Signs of Tradition: Native American Lessons, Math and Science Teachers for Reservation Schools (MASTERS) Project, University of Kansas, 1993 & 1994. (785) 864-4435 jnewland@ukans.edu

Keepers of the Earth, Keepers of the Animals, Keepers of Life, Keepers of the Night by Michael Caduto and Joseph Bruchac, Fulcrum Pub., 350 Indiana Street, Suite 350, Golden, CO, 80401, 1988-1998.

Native Science, Natural Laws of Interdependence by Gregory Cajete, Clear Light Pub., 2000.

Ignite the Sparkle: A Native American Science Education Curriculum Model by Gregory Cajete, Kavaki Press, Skyland, NC, 1999.

American Indian Science, A New Look at Old Cultures by Fern Brown, Twenty First Century Books, 1997.

Native Americans and the Environment, Center for Conservation Biology http://www.conbio.rice.edu/nae

Indian Country: A History of Native People in America by Karen D. Harvey and Lisa D. Harjo, North American Press, 350 Indiana Street, Suite 350, Golden, CO 80401, 1994.

Rethinking Columbus, The Next 500 Years by Rethinking Schools, LTD. Available from Four Winds Books, York, NE.

ORGANIZATIONS AND PROJECTS

American Indian Science and Engineering Society, P.O. Box 9828, Albuquerque, NM 87119 Publishes Winds of Change Magazine. (505) 765-1052 www.aises.org

Science Through Native American Eyes, Cradleboard Teaching Project, Nihewan Foundation for American Indian Education founded by Buffy St. Marie. Interactive Multimedia CD Rom for grades 5-adult. www.cradleboard.org

American Indian/Alaska Native Initiative, National Science Foundation Rural Systemic Initiative, Tribal Colleges, Alaska, Utah-Colorado-Arizona-New Mexico (UCAN), Navajo Nation project, NSF, Arlington, VA http://www.nsf.gov

Wordcraft Circle of Native Writers and Storytellers publishes Moccasin Telegraph newsletter, 9 East Burnam Road, Columbia, MO 65203

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